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St. Thomas's and Its Reredos

By Ernest Peixotto

IN the handsomest portion of Fifth Avenue, only a few blocks apart, stand two great churches, both in the Gothic style, both imposing by reason of their bulk and dimensions. But here their similarity ends, for St. Patrick's Cathedral, though the larger of the two, though the more symmetrical and regular in plan, though carefully studied after the best traditions of the Gothic builders, leaves a cold and harsh impression upon the beholder, while its neighbor, St. Thomas's, seems a living thing, a creation imbued with life, possessing that subtle, tactile quality that a sculptor so aptly ndicates by rubbing his thumb briskly upon his forefinger.

To impart this rare quality to a great work of ecclesiastical architecture is, I think, one of Mr. Bertram G. Goodhue's greatest gifts, one that places him at once among the foremost church architects of the day. The architect of ecclesiastic buildings is forced, perhaps more than any other, to conform to traditions, to follow certain precedents, to design after given formulas, but Mr. Goodhue succeeds, despite these restrictions, in making his noble churches alive and part of our life to-day.

The plans for St. Thomas's Church were drawn, it is true, by the firm of Cram, Goodhue & Ferguson, and Mr. Cram, the other great exponent of the Gothic spirit in America, must share with Mr. Goodhue a certain amount of the credit of the design. But the church as we see it to-day is essentially Mr. Goodhue's.

Its exterior is picturesque. Asymmetrical, with a sturdy, square tower on one corner, balanced only by a delicate tourelle on the other side of its porch, the centre of the edifice is not placed in the centre of the plot. Its north wall is, you might say, a blind party wall, designed to become part of the business building that adjoins it. A deeply recessed portal shades handsome niches decorated with richly pierced canopies, and is surmounted by a beautiful rose-window with elaborate traceries, above which an open arcade, adorned with niches and crocketed pinnacles, stands silhouetted against the sky. All this richness of detail contrasts agreeably with the simple wall-spaces of the tower and of the massive buttresses that support the main walls. The detail is drawn from the creations of the later-Gothic builders, and its delicacy and elegance make St. Thomas's appear less robust than some of Mr. Goodhue's other churches, notably St. Vincent Ferrer's.

Processional door.

Along the south side of the edifice, in the side-street, lies a chapel used for wed-

dings and lesser ceremonies, that is entered by its own delicately sculptured doorway. Behind this chapel rise the arcades and mullioned windows of the Parish House, capped by an octagonal tourelle. Above these buildings runs a long range of clerestory windows that forms one of the finest features of the fabric.

The interior of St. Thomas's produces a profound impression of dignity and harmony of proportion, and again evinces Mr. Goodhue's conspicuous talent for creating living architecture, for although a new church, it already has the tone of an edifice that has existed for many years. The stonework, of Kentucky sandstone, is warm and ingratiating in color, the joints being emphasized with dark-gray cement. The nave is broad and lofty and so arranged that practically all seats command a view of the pulpit and altar. Its massive piers are devoid of capitals. Engaged in them, slender ribs rise unbroken from the floor to the spring of the main vaults poised high overhead. Along each side of the nave run narrow aisles, whose places in the façade are marked by the two picturesque little doorways at each side of the main portal. The north aisle is bordered by the simple masonry of the great blank wall to which I have alluded, while the south aisle opens into the chapel to which I have referred —a chapel with its own polychrome altar, its own aisle and pews, and with low vaults that support a gallery that adds materially to the seating capacity of the main church.

Through the nave, looking toward chancel.

But, from the very entrance, the eye is immediately attracted by the exceeding richness of the chancel, where the great reredos—a gigantic work of art only just completed—rears itself aloft, piling its niches, its sculptured figures, and its pinnacles from the altar to the topmost curve of the main vaults of the church, a height of some eighty feet.

This reredos is, I believe, one of the greatest accomplishments in modern ecclesiastical art. The union between architect and sculptor seems quite complete. Its several tiers of niches, peopled with saints and prophets, with great reformers and dignitaries of the Christian Church, rise one upon another, cut in stone of the same warm character as the rest of the church and forming an integral part of it. These niches are shaded by richly carved canopies and separated by slender columns or by delicate buttresses ornamented with exquisite detail.

Toward its summit, the reredos is pierced by three openings, that reveal windows which, though not intended to be permanent, are glazed in the rich, jewel-like tones of the glass at Chartres.

Immediately above the high altar, which in itself is extremely simple, in a deeply recessed porch, stands a group of figures that depict St. Thomas kneeling as he recognizes the Risen Christ. Above this porch towers a great cross, surmounted by a crown of thorns, capped by a diadem, and surrounded by adoring angels enclosed in a flat panel whose frame is embellished with scrolls and foliations, and with shields showing the implements of the Passion.

Above the cross again, in a glorified calvary, appear life-size figures of Christ, St. Mary, and the Beloved Disciple, while in niches above these and about them appear apostles and saints, missionaries and reformers, divines of the Episcopal Church in England and America. All these figures have been carefully studied in their relationship to each other and to the whole, and produce that wonderful impression of richness combined with order, of dignity combined with grace, that quite overpowers the beholder in the storied retables of Italy and Spain.

The work of the sculptor forms no mean part in the success of this accomplishment, for, as in much of the late-Gothic work, the stonecutters art almost overshadows that of the architect.

When I asked Mr. Goodhue how far his plans went toward determining the actual detail of the sculpture, for reply he showed me the three-quarter-inch-scale drawing of the reredos, a vast drawing on which are plainly indicated the position and attributes of each figure and a clear suggestion at least of all of the ornament. He also showed a section of the entire work as well as plans made at a number of different levels, at every height, indeed, where the plan changed materially, with the profiles of the mouldings, the depths of the niches, the diminishments of the buttresses—all the complications and intricacies, in short, minutely worked out. He dwelt too upon the zeal and the quality of the work of his assis-

St. John the Baptist.

St. Thomas.

tants, Messrs. Jago and Murray, to whom he unselfishly gives much credit.

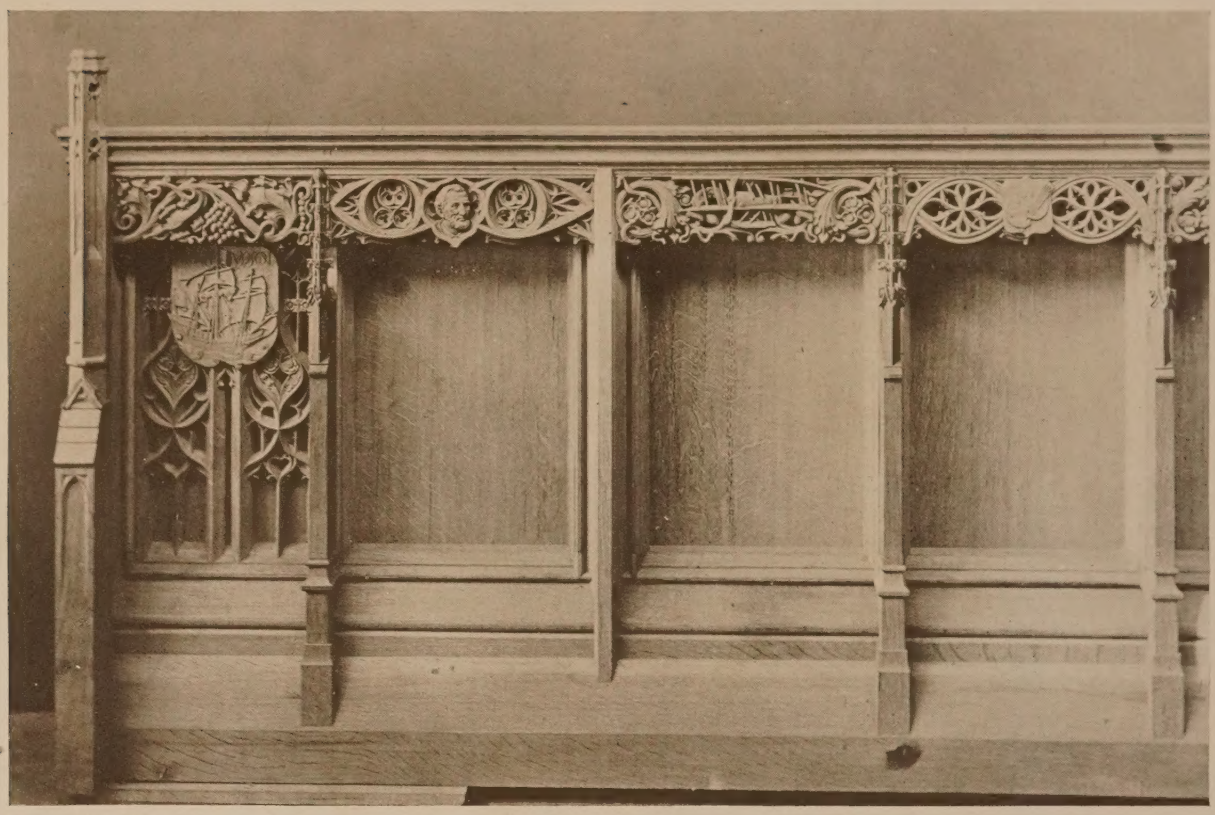
From their plans the sculptor, Mr. Lee O. Lawrie, took up his problems one by one, and for each problem he modelled his figure or his ornament. He has, I think, succeeded to a remarkable degree in imparting the Gothic spirit to his work, as the details reproduced with this article will show. His figures of the early saints and martyrs—St. Francis or St. Athanasius, for example—have that suffering, mystical aspect so characteristic of true Gothic statues, their thin draped figures treated with the elongations so loved by the mediæval sculptors, who sought, by means of them, to tie their statues to the perpendicular lines of the architecture about them. In his more modern figures of the prelates of the English Church—Canon Liddon, Bishop Selwyn, Bishop Payne—he has individualized his personages, basing his portraits on reliable data without departing too much from the proper decorative spirit, adjusting each figure successfully to the shape of the niche in which it belongs and to the general Gothic spirit of the reredos.

These qualities are equally apparent in his sculptured ornament. His birds and beasts, his foliations and traceries, have been designed to fit their spaces nicely and in proper scale, enhancing, with their varied detail, the amazing richness of the whole. The actual cutting of the stone was done by Ardolino Brothers, who have seconded the architect's intention by leaving their work in the rough, so to speak; that is, devoid of those finished and polished surfaces that are so out of the spirit of Gothic sculpture.

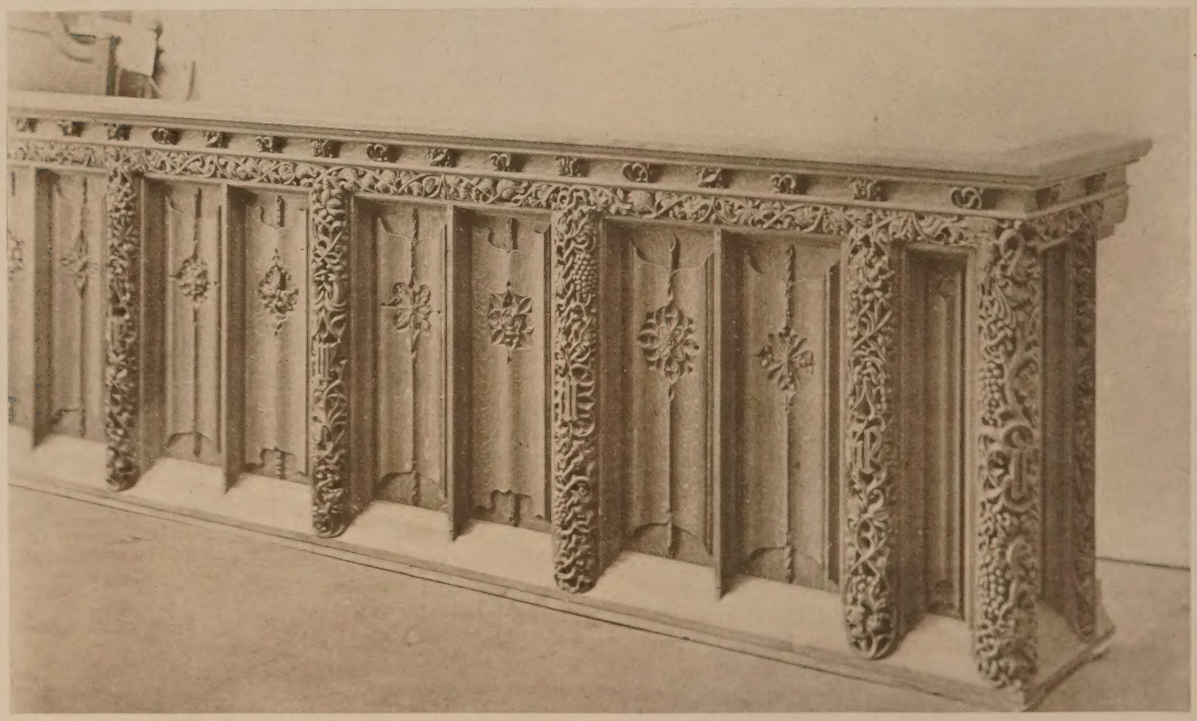
When one approaches the reredos for a nearer view of its manifold details, one perceives that the sedilia also, as well as the stalls, the pulpit, the lectern, and the organ case, have been elaborately enriched by a wealth of wood-carvings done under Mr. Goodhue's supervision by the firm of Irving & Casson—A. H. Davenport Co., of Boston and New York.

The choir is separated from the nave by a parapet or railing made of inlaid stone and marble. At one end of this rail rises the pulpit, at the other end the lectern. The pulpit is unusually ornate. It is octagonal in shape, each of its

(*Continued on page* 198.)

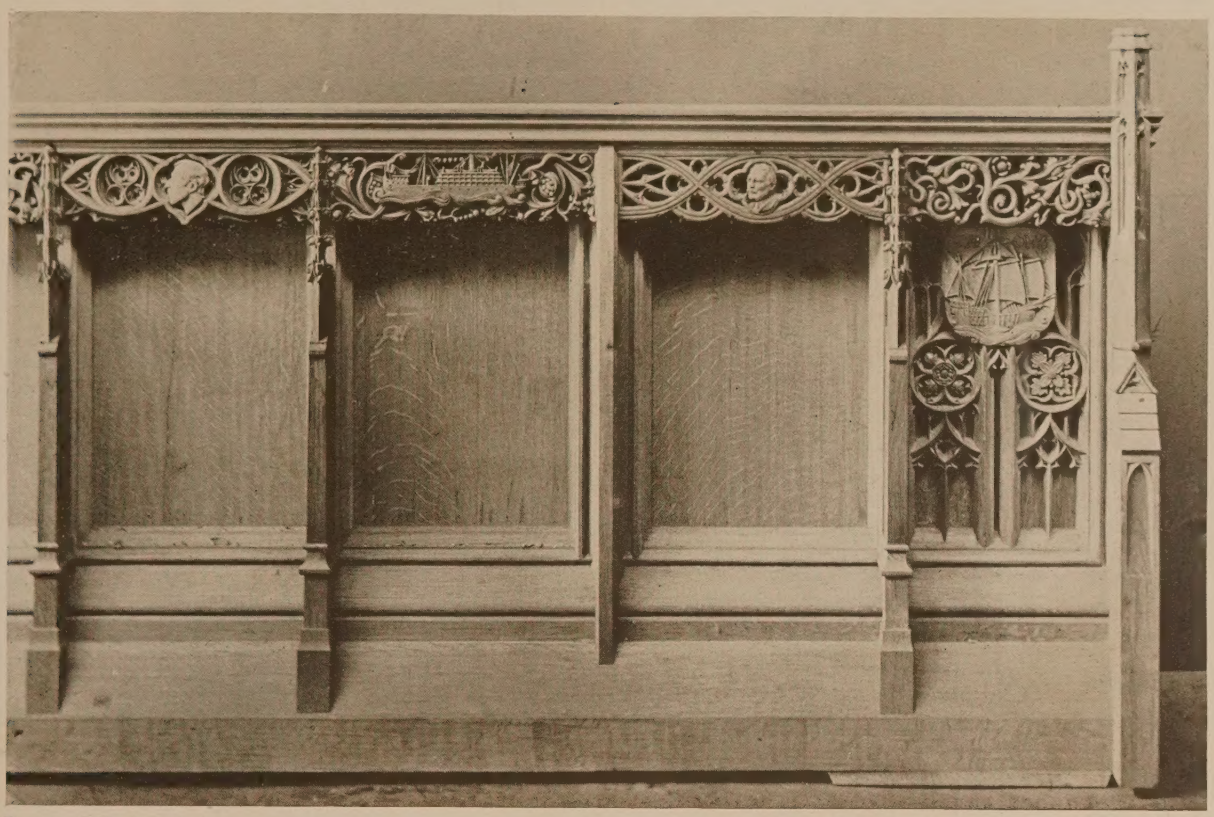


Fronts of Choir Seats.



Parapet over Choir. Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.



Fronts of Choir Seats.

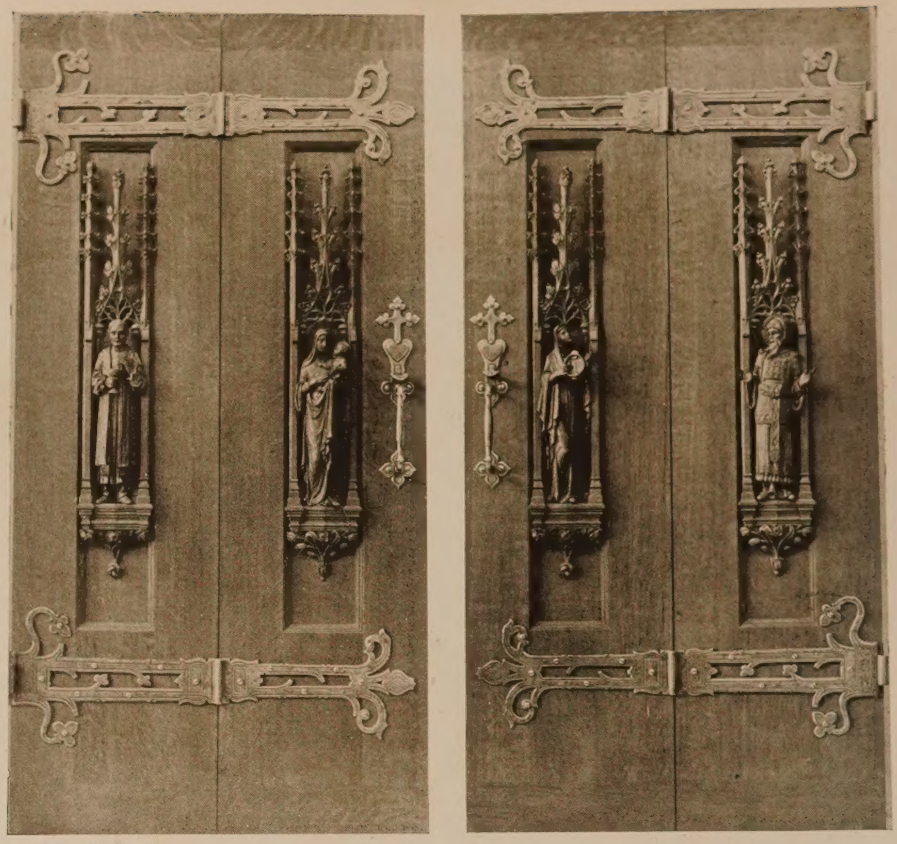
Clergy Stalls.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

(*Continued from page 195.*)

exposed faces being decorated with three figures of renowned churchmen separated from each other by slender buttresses that uphold canopies of the richest flamboyant style. The pulpit hood is also decorated with carved ornament and a particularly beautiful cresting. It is tied by arches and crocketed pinnacles to the organ case, that rises high above it enriched also with elaborate carvings.



The doors of the aumbry.

Each side of the chancel is lined with stalls for the choir and clergy. Those along the wall are provided with pierced canopies of flamboyant design and with misericordia carved with fantastic animals and birds. The backs of the book-rests in front of each seat are carved with Biblical scenes—David and Goliath, the Crossing of the Red Sea, and kindred subjects—the little wooden figures being treated with the naïve simplicity and exaggeration of proportions so common in the work of the mediæval sculptors.

But all of the scenes are not drawn from the traditions of the past. As this church furniture and the great reredos were designed and executed during the turbulent years of the World War, this fact is commemorated in a number of incidents. Portrait reliefs of the Allied commanders—Foch, Joffre, Pershing—and of the Allied rulers—Wilson and Poincaré, Victor Emmanuel and George V—occur in the stonework, while in the panels carved in the woodwork appear the Sinking of the *Lusitania*, Allenby as he enters Jerusalem, and other episodes of the great war. On the parapets of the rector's and curates' stalls are carved the coats of arms of the Allied nations, while the mosaic of Rheims Cathedral on the chancel-rail is made of stones that actually were brought from the martyred cathedral. In the cove of the parclose screens the ribs terminate in a number of portrait heads, among which may be recognized those of the donor, the organist, the wood-carver, and the rector, Doctor Ernest M. Stires, who is responsible for the final choice of subject of most of the sculptured detail. There is, indeed, a wealth of incident quite beyond description, surpassing anything of the kind that I can recall.

One of the bishops—panel on back of sedilia.

And all this is quite as it should be, marking for future generations the historic epoch in which this great work of art was created, stamping it with the history of its day, even to the semijocose utilization of such motives (carved on the misericordia) as the prohibition movement and the ultimate consumer crushed between Capital and Labor.

But these are mere details made for the edification of those of a literary turn of mind. The dominant effect produced by St. Thomas's Church upon the beholder has nothing to do with these.

When one considers its interior as a whole, one forgets details and remembers only an impression of vast and harmonious proportions, of soaring arches and strong

The assistant rector's seat.

Ends of choir seats.

pillars whose perfect proportions and perfection of alignment accord well with the stately and ordered decorum of the Anglican Church. But even taking these facts into account, the elements that go to make up the beauty of this edifice are more complex. It is, for instance, admirably lighted, and so its light plays a conspicuous part in the general harmony of the whole, sifting down in medium intensity from the huge glazed spaces of the clerestory windows, creating a restful atmosphere of quiet and tranquillity.

It bathes the simple surfaces of bays and walls with a soft effulgence in which, as in the compositions of the great Spanish architects, whose work Mr. Goodhue loves so well, the great reredos forms the one spot of rich detail, gleaming at the end of the chancel like a costly jewel set in its plain setting.

Courses in Architecture at Columbia University—Summer Session

THE architectural school, which this summer offers more than twenty intensive courses, has adopted many of the army methods of training men in both theory and practice for practical work.

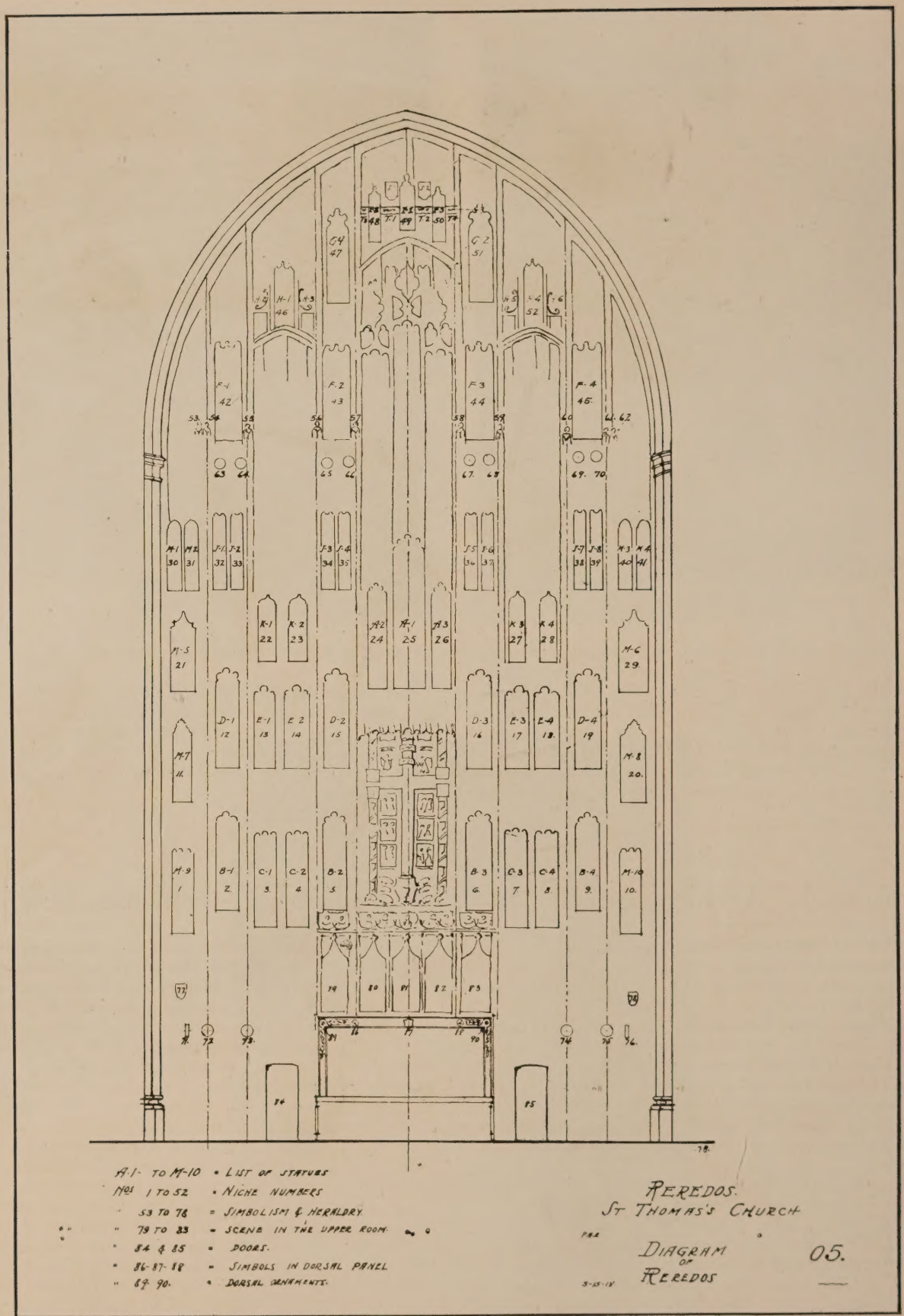
The courses have been so arranged as to be of particular value in view of the evident portent of the coming building boom, which will make a great demand for practical architects. H. V. Walsh will be departmental representative for the work, which will count toward the degree in architecture for students who have satisfied the entrance requirements and are open to all qualified students without examination.

The elements of free-hand drawing, lettering, drawing geometrical figures from dictation or diagrams, ornament forms in outline, simple architectural details, isometric projections, outline sketching from flat casts and from models will be taught by George Marcus Allen, instructor in graphics at Columbia, in a course which covers the requirements of the College Entrance Examination Board in free-hand drawing.

Professor Charles A. Harriman will give two courses in the elements of design, in one of which he will be assisted by Mr. Allen. Courses in elementary design, intermediate design, and advanced design will be given under M. Maurice Prevot and A. E. Flanagan.

For students beginning the study of architecture a course in architectural drafting covering drafting as seen from the architectural point of view, visualization, use of instruments, alphabets and lettering, standard drafting practice, symbols and indications of frame, brick, and stone construction, materials and fixtures, working drawings, large-scale drawings, architectural and structural details, sizes and space allowance for fixtures will be given by Mr. Allen.

Professor Harriman will give courses in charcoal drawing, pen-and-ink drawing, and pencil drawing, and Joseph Lauber will give an elementary and advanced course in water-color drawing. Courses in shades and shadows and perspective will also be offered. Surveying courses to be given at Camp Columbia, Litchfield County, Connecticut, will be open to students in architecture.


A-1 TO M-10 = LIST OF STATUES
NOS 1 TO 52 = NICHE NUMBERS
" 53 TO 78 = SIMBOLISM & HERALDRY
" 79 TO 83 = SCENE IN THE UPPER ROOM
" 84 & 85 = DOORS.
" 86-87-88 = SIMBOLS IN DORSAL PANEL
" 89-90. = DORSAL ORNAMENTS.
REREDOS.
ST THOMAS'S CHURCH
DIAGRAM OF REREDOS
05.
3-15-17

St. Thomas's Church

Cresting Under the Central Panel of Reredos. (Model.)

Subjects of Carving on the Chancel Fittings

Subjects of Cut Stonework in Parapet

Emblems of the Church

22. Ship.
23. Lighthouse.
24. City of Refuge.
25. Kingdom of God, tree, fowls.

The Church of America

26. 1607, Jamestown—First Communion.
27. Independence Hall, 1776.
28. 1865, Blue and Gray.
29. Rheims Cathedral, 1918.

Subjects in the Wood-Carvings

Figures on Balcony at end of Aisle

Presbyterian Church in the U. S.
Church of England.
Greek Church.
Church of Rome.
Church of the United States.
Council of the Church, U. S.

Figures in Pulpit

Henry Parry Liddon, Canon of St. Paul's.
John Henry, Cardinal Newman, oratorian.
William C. Magee, Archbishop of York.
John Wycliffe, Rector of Lutterworth.
John Chrysostom, Bishop of Alexandria.
Girolamo Savonarola, O. P., Florence.
Frederick W. Robertson, incumbent of Trinity Church, Brighton.
John Wesley, sometime Fellow of Lin. Coll., Oxon.
Frederick Denison Maurice, a noted English divine.
Jean Baptiste Massillon, Bishop of Clermont.
Jacques Benedict Bossuet, Bishop of Dijon.
Frederic Monod, fundator of the Evangelical Church of France.
Henry C. Potter, Bishop of New York.
Phillips Brooks, Bishop of Massachusetts.
Thomas Underwood Dudley, Bishop of Kentucky.
Canon Farrar, Dean of Westminster.
William Boyd Carpenter, Bishop of Ripon.
Frederick Courtney, Bishop of Halifax.
W. R. Huntington, Rector of Grace Church.

Figures in Rector's and Assistant's Seat

Rector's Side

Beginning at north side:

1. Dante.
2. Jeremy Taylor.
3. Augustine (on front).
4. Thomas à Kempis.

In back of seat:
The Ascension.

Assistant's Side

1. Chaucer.
2. Shakespear.
3. Pusey.
4. Milton (on front).
5. Bunyan.

In back of seat:
Council of Nicæa.
In front of desk:
Conversion of St. Paul.
The organists on the two rows of seat ends on the west front—
Reading left to right, west front:

1. Merbecke.
2. Farrant.
3. Gibbons.
4. Purcell.

Reading left to right, east end:

1. Croft.
2. Boyce.
3. Nares.
4. Purcell.

Miserere Seats

Epistle side, starting from east end:

1. Lion eating straw like the ass.
2. The dove and ark.
3. The cow and the bear shall feed . . . together.
4. The swallow has built her nest upon thine altar, O Lord.
5. The wolf and the lamb.
6. A phœnix—copy of an ancient miserere.
7. Young lions seeking their prey.
8. Foxes have their holes, etc.
9. The Russian bear being doped.
10. The Gallic cock.
11. Vine (Rector's seat).

On the north side, starting from the west end:

12. Salvation Army lass with doughnuts.
13. Out of the strong cameth forth sweetness.
14. The American eagle plucking the imperial eagle.
15. Prohibition overturning Bacchus.
16. St. George and the Dragon.
17. The Ethiopian eunuch baptized by Philip.
18. St. Christopher, patron of those who travel.

Emblems on seat ends:

S.E. Our Lady's Jester.
N.W. "Sursum Corda" (the ancient notes).
S.W. The honey-bees.
N.E. Cock.

St. Thomas's Chancel Fittings

Emblems along front of boys' desks, starting from the east end, Epistle side:

1. Doctors.
2. Engineers.
3. Bankers.
4. Authors.
5. Architects.
6. Musicians.
7. Wireless.
8. Railway.
9. Blacksmiths.
10. Telephone.
11. Sculpture.
12. Steamship.
13. Shield of Roosevelt.
14. Christopher Columbus (shield with ship).

North side starting from the west end:

1. Henry Hudson (shield with his ship).
2. Abraham Lincoln.
3. Airplane.
4. Painting.
5. Automobile.
6. Fulton's steamboat.
7. Telegraph.
8. Airship.
9. Woodcarver.
10. Cotton.
11. Electrical.
12. Iron, steel.
13. Teachers.
14. Lawyers.

Scenes carved in fronts of clergy kneeling-desk, starting from east end, Epistle side:

1. Adam and Eve expelled.
2. Sacrifice of Isaac.
3. Jacob's Dream.
4. Crossing the Red Sea.
5. David and Goliath.
6. Solomon building the Temple.
7. Elijah rebuking Ahab and Jezebel.
8. Belshazzar's Feast.
9. Nehemiah rebuilding Jerusalem.

North side starting from the west end:

1. Allenby entering Jerusalem.
2. Missions.
3. Cranmer, Latimer, and Ridley.
4. St. Paul, Mars Hill.
5. Pentecost.
6. Feeding the multitude.
7. Magi.
8. Nativity.
9. Church in America.

Gargoyles in cove, starting from the east end, Epistle side:

1. King of England.
2. King of Belgium.
3. Clemenceau.
4. Poincaré.
5. Lloyd George.
6. Haig.
7. English admiral.
8. Joffre.
9. Aviator.
10. Gob.
11. Ordnance.
12. Red Cross nurses.
13. Doctor Noble (organist).
14. Mr. Steele (donor).
15. Mr. Goodhue (architect).
16. Doctor Stires.
17. Mr. Casson (woodworker).

Starting from the west end:

1. Mr. Irving (woodworker).
2. Cardinal Mercier.
3. Burgomaster Maxe.
4. Bishop Brent.
5. Bishop Burch.
6. Artillery.
7. Red Cross.
8. Private.
9. General Allenby.
10. Mr. Hoover.
11. General March.
12. French admiral.
13. Foch.
14. Pershing.
15. American admiral.
16. King of Italy.
17. Paderewski.
18. President Wilson.

Sedilia

On Top:

Emblems of the Four Evangelists.
Three Bishops:
Bishop Courtney.
Bishop Whitehouse, Illinois.

Bishop Mackay Smith, Pennsylvania.

Four Deacons: St. Stephen, St. Philip, St. Lawrence, St. Francis.

On arms of Bishop's and Priests' seats:

Moses, Aaron, Timothy, Titus, Ignatius, Polycarp.

On fronts:

Consecration of Bishop White.
Consecration of Bishop Seabury.
Charge to St. Peter.

St. Paul laying on hands.
Bishop Greer laying foundation-stone of St. Thomas's.
Bishop Greer consecrating St. Thomas's.

List of Statues, Symbolism, and Heraldry for the Reredos

A–1. Our Lord. Two shields, five wounds.
A–2. Blessed Virgin Mary, in tunic, mantle, and veil. Shield, lily combined with monogram.
A–3. St. John the beloved Disciple, in tunic and mantle. Shield, chalice with protruding serpent.
B–1. St. John Baptist, holding lamb on book, clothed in camel's-hair rug.
B–2. St. Paul the Apostle. Shield, three fountains.
B–3. St. Peter. Shield, two keys crossed.
B–4. St. Thomas. Shield, spear on square.
C–1. St. Matthew. Shield, angel.
C–2. St. Mark, Evangelist. Shield, lion.
C–3. St. Luke, Evangelist. Shield, a bull.
C–4. St. John, Apostle and Evangelist. Shield, eagle.
D–1. St. Bartholomew. Shield, knife and book.
D–2. St. James Major. Shield, hat on staff and two shells.
D–3. St. Andrew. Shield, St. Andrew's cross.
D–4. St. Matthias. Shield, book and scimitar.
E–1. St. Philip. Shield, cross between two loaves.
E–2. St. James the Less. Shield, saw.
E–3. St. Simon. Shield, two fish.
E–4. St. Jude. Shield, boat.
F–1. St. John Chrysostom. Shield, beehive.
F–2. St. Athanasius. Shield, two columns.
F–3. St. Jerome. Shield, lion.
F–4. St. Augustine. Shield, flaming heart pierced with arrow.

Eight Emblems Across Reredos Below the Above Emblems of Old and New Dispensations:

1. Flood—Ark.
2. Divine Presence—Ark of the Covenant.
3. Crucifixion—Brazen serpent.
4. Resurrection—Jonah and whale.

Four New (Right)

1. Annunciation, Nativity—Lily and star.
2. Crucifixion—Three crosses.
3. Resurrection—Open tomb.
4. Church—Ship over crossed keys.

Arts and Crafts of the Church

Ten figure subjects—upper part of reredos:

1. "Setting out" the stonework.
2. The stone-carver.
3. The secretary.
4. The donor of the reredos.
5. The rector.
6. The architect.
7. The draftsman.
8. The sculptor.
9. The plasterer.
10. The stone-setter.

Six emblems of Our Lord circled by wreaths in lower part of buttresses, left to right facing:

1. Flaming sun.
2. I. H. S.
3. Dolphin.
4. Three fish.
5. X. P. S.
6. Phœnix.

Two small shields, one at extreme end in lower portion:

Cross and candlesticks—left facing, The Church.
Seven-branched candlesticks—right facing, The Synagogue.

G–1. St. Stephen, protomartyr, vested as a deacon. Principal shield, dalmatic with five stones. Twelve minor shields, dalmatic, letter S and three dice variants.
G–2. St. Philip the Deacon. Shield, three crowns.
H–1. St. Polycarp. Shield, burning fagots.
H–2. Savonarola.
H–3. St. Gregory the Great.
H–4. St. Francis of Assisi.
H–5. St. Ignatius.
H–6. St. Cyprian.
I–1. Angels holding innocents. Text across group.
I–2. Angels holding innocents.
I–3. Angels holding innocents.

Two shields flanking central "innocent":

Arms of see of New York (left facing), arms of parish (right).

J–1. Restitutus.
J–2. St. Columba, abbot of Iona.
J–3. St. Augustine of Canterbury. Shield, font.
J–4. St. Theodore, Bishop of Canterbury. Shield, arms of Canterbury.
J–5. St. Bede the Venerable—monk of Jarrow.
J–6. Wycliffe, in mass vestments. Shield, morning star of Reformation.
J–7. Cranmer—Archbishop of Canterbury. Shield, arms of Canterbury.
J–8. Laud, Archbishop of Canterbury. Shield, arms of Canterbury.

Missionaries:

K–1. Selwyn (George Augustus), Sometime Primate of New Zealand. Shield, arms of Christ Church.
K–2. Patteson (John Coleridge), Bishop of Melanesia. Shield, arms of Melanesia.
K–3. Payne (John), Bishop of Cape Palmas. Shield, mitre and staff with "Palmas."
K–4. Williams (Channing Moore), Bishop of Yedo. Shield, mitre and staff with "Yedo."
M–1. Hooker, rochet and chimere.
M–2. Butler, rochet and chimere.
M–3. J. Wesley in surplice and stole.
M–4. Canon Liddon—as a canon of St. Paul's.
M–5. Gladstone, over. Shield, Gladstone arms.
M–6. Seabury, first Bishop of Connecticut, rochet and chimere. Shield, Seabury arms.
M–7. White (William), first Bishop of Pennsylvania. Shield, arms of diocese.
M–8. Washington. Shield, his arms.
M–9. Phillips Brooks, Bishop of Massachusetts, rochet and chimere. Shield, arms of see of Massachusetts.
M–10. Tuttle, Presiding Bishop (Missouri), rochet and chimere. Shield, arms of Missouri.

Emblems in central portion of reredos—main panel:

Scene in the upper room from the life of St. Thomas from St. John's Gospel, 20th chapter, Christ showing his wounds to the doubting Apostle.

Panel of the cross:

Cross of the vine rising from shield containing a chalice circled by crown of thorns and with text, "This do in remembrance of me."

Cross crowned, and below angels bearing superscription with monograms I N R I Ribands circling angels containing inscription: "The leaves of the tree were for the healing of the nations."—Rev. 22 : 2.

Lower portion contains six panels of angels as originally modelled by Saint Gaudens, separated by the words of the Te Deum, from "We praise thee, O Lord," to "Thou didst open thy Kingdom of heaven to all believers."

At the foot of the cross, lambs drinking from rivers, representing the means of grace.

Four emblems of the Evangelists at the ends of arms of cross—two at each end:

Matthew, angel, and Mark, lion (top), Luke, ox, and John, eagle (bottom).

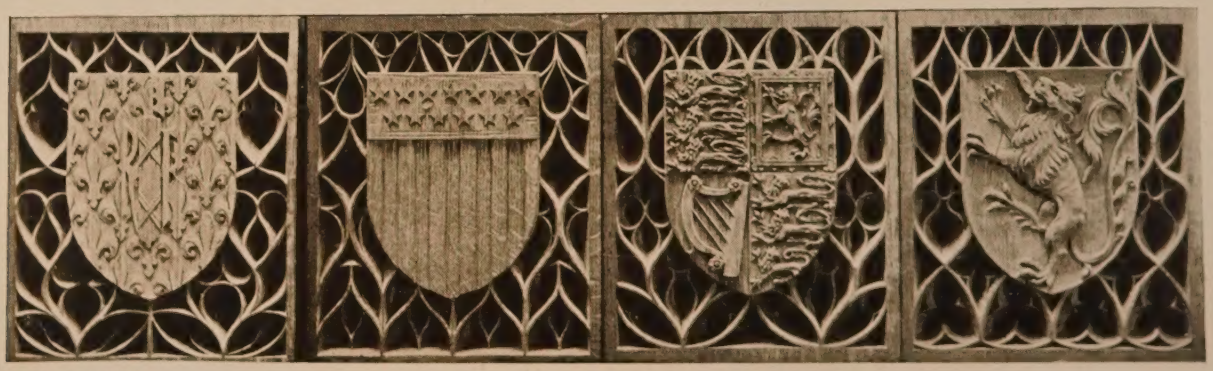
At each side are twelve emblems of the Passion. Left side facing, beginning at top:

1. Cock, with motto, "I know not the man," Matt. 26 : 72.
2. Money and bag, "I have betrayed," Matt. 27 : 4.
3. Basin and ewer, "I wash my hands," Matt. 27 : 24.
4. Column, "With his stripes."
5. Scourge, "He was scourged."
6. Lanthorn (no inscription).
7. Coat and dice, "They cast lots," John 19 : 15.
8. Crown of thorns, "They crowned him."
9. Hammer and nails, "They nailed him."
10. Cross, "If I be lifted up."
11. Ladder and spear, "They pierced my side."
12. Pincers.

Shield in middle of central panel above altar, arms of parish.

Shield in centre of face of mensa I–C–X–C—N–I–K–A, with cross.

In the two curves at the side above the windows are representations of 1. The Annunciation; 2. Adam and Eve expelled from Paradise.



Shields of the Allies.

Editorial and Other Comment

Industrial Housing

WE are indebted to Fred T. Ley & Co., Inc., for a pamphlet prepared by Mr. Leslie H. Allen on "Home Building for Wage-Earners." In it we find summarized with great clearness the result of wide experience in the construction of homes for industrial workers, both for the government and large private corporations. The subtitle, "A Financial and Economic Problem," best expresses the point of view of the discussion, and to this aspect of what is probably one of the greatest human problems of modern times the writer brings clear vision and an analysis of tried methods.

There is hardly a city or town in the country where the congestion has not become a menace to the general welfare of the community, or where varying methods of trying to solve the problem have not been considered. Housing shortage and labor shortage are bound together, and the solution of the first seems the essential step in making possible the resumption of production so vitally needed, if we are to find a way out of the prevailing high prices.

Our population has grown apace, our building construction in the way of homes has been almost at a standstill. The old days when a laborer would put up almost any sort of a hovel where he could sleep have gone with the coming of high wages. The workman of to-day demands and expects a comfortable home for himself and family, and goes where he can find them, for he is no longer at the mercy of mere local employment, but may choose the place and work that best provides the most favorable living conditions.

Former speculative building projects no longer even begin to meet the demand; in fact, they are no longer possible at present high costs and uncertainty of everything concerning building.

"What Is a Fair Rent?" "Resale and Repurchase," "Renters," "Financial Plans," "Loan Associations," "Methods of Selling," "The Copartnership Policy," "The Best Type of House," "Economy in Large-Scale Operation" are some of the very pertinent matters discussed by Mr. Allen. We commend these last two extracts for especial consideration:

"*Management.*—If a housing enterprise is to be really successful, too much emphasis cannot be laid on the importance of good management. One untidy or disorderly tenant can spoil the surroundings of a whole block. Destructiveness if not checked at the outset will soon ruin the best-built premises.

"Overcrowding must be prevented by proper restrictions in the leasing or selling of the property, and a district nurse or friendly rent-collector should make periodical inspections to see that the premises are kept clean and that the tenants are living decently."

"*Conclusion.*—During the war over one hundred millions were spent on housing. The evidence collected by government officials proved that good housing was necessary to reduce labor turnover, to increase production, to maintain health and efficiency, and to make men contented.

"We are now in a condition of industrial unrest where high turnover, low production, low efficiency, and industrial discontent are menacing national prosperity and happiness.

"The measures that were used to allay these troubles in time of war are equally needed now. Good housing was one of the chief remedies.

"Until every citizen has a place which he can think of with pride and affection as 'Home,' we shall not be enjoying to the full the *Life*, *Liberty*, and the pursuit of *Happiness* that is our national aim. We want America to be not merely a 'melting-pot' but the *Home* of every citizen.

> "Home turn the feet of men that seek
> And home the hearts of children turn."

Good for Detroit

WE have been reading with a mood of cheering optimism born of the text a pamphlet on the "Building Zone Plan for Detroit." One sentence gave us pause for thought, and brought pictures of certain localities in many of our Eastern cities that are even yet a disgrace to so-called civilization. Perhaps they are not as bad as they used to be, but bad beyond words they are even yet, and with the present congestion of population some of them will be very apt to revert to the worst conditions of the old days.

No wonder Detroit is proud when she can say: "This city is now free from the character of slums and tenement-house development existing in many Eastern cities."

Detroit has always been spoken of and looked upon as a city of homes, but "the intensity of the use of the land" is even there an increasing question. The manifest need for the multiple house will raise the intensity of population per acre, and the intrusion of the multiple house is apt to be, as the intrusion of the store, the garage, the factory, destructive of the character of an entire neighborhood.

Detroit has, too, her own very serious traffic problem, one of the most pressing of all cities, owing, no doubt, to its being such a great centre of the automobile industry.

Zoning regulations are being established all over the country, but the dead past will have to bury its dead, and with the present critical need for places where people may exist—we would not call it living—there may be an inevitable tendency to forego many of the gains already made.

"Increasing city growth causes more intensive residential development, which should be curbed in the interest of public health and safety. Studies of new multiple-house construction built under the pressure of a rapidly increasing population discloses in some cases a density of 1,000 persons per acre—an astonishing and alarming condition. If Detroit is to retain anything of its former pride as a city of splendid residences and homes, its present average density of population should be maintained in so far as possible."

A Great Ecclesiastical Monument

A LARGE part of this number of ARCHITECTURE is given to a presentation of the great reredos and the woodwork of St. Thomas's Church, New York, recently completed under the direction of the architect, Mr. Bertram Grosvenor Goodhue. We feel quite sure that most of our readers will think with us that we are justified in making this representative showing of a work of such great distinction. The church itself is one of the notable Gothic structures of the present day, and we know of few great churches in Europe where a reredos of such magnitude and beauty and such woodwork may be found. This, we sincerely believe, is a number of ARCHITECTURE that every subscriber will value highly as a record of a really great modern Gothic monument of art.

Mr. Goodhue, we are advised at this writing, has been chosen as the architect for the new capitol of Nebraska. Out of a list of ten competitors who submitted plans he was selected by a jury of three disinterested architects, Waddy B. Wood, of Washington, James Gamble Rogers, of New York, and Willis Polk, of San Francisco. The choice was confirmed by the members of the capitol commission comprising Governor S. R. McKelvie, of Lincoln, William H. Thompson, of Grand Island, William E. Hardy, of Lincoln, Walter W. Head, of Omaha, and George E. Johnson, state engineer. Thomas R. Kimball, advisory architect for the board, assisted the jury in its decision.

Co-operation

TO THE EDITOR OF ARCHITECTURE:

In the past year or so it has percolated through to some of the architectural profession that there exists somewhere in New York City a model co-operative multiple dwelling. This enterprise has been hailed as a means of lifting us out of the present money shortage for housing. The writer visited this group of buildings some time ago, and desires to correct some of the impressions which are given credence concerning it.

Assuming, like other architects, that it would be masterfully designed and set in a parked space, we passed it by without notice, but finally returned to the street number given me. We entered an ordinary building similar to the type with which Brooklyn, Manhattan, and the Bronx are too profusely provided. Upon being invited to enter one of the apartments, however, the spirit of the place became evident. The ideal that had been in practical operation was then explained by three or four of the co-operators.

First essential. The co-operators had inherited the science of co-operation, and desired to co-operate in the realm of home production. They did not by any means do this for the monetary saving alone, but they did it also for the peace of mind that was engendered, and which is so obvious even to a casual observer. Next, how did they proceed? They took the building plans to the usual loaning institutions and found out about how much they could borrow, just as any of us would do. Finally they borrowed from a very usual source. Then they made up the rest of the equity among themselves. This was the interesting part, for some of them had not sufficient capital to supply the fund necessary to enclose the space they were to occupy. But others among them were better supplied with money. Finally a group concurred that could aggregate the necessary amount. Here is the co-operative element. All had five hundred dollars, so they each put that in without interest and called it a share. Some had more, others a good deal more. They hired the additional "capital" necessary to make up the needed amount at the rate of 7 per cent per annum.

Now, after a few years' operation, intruders like myself discover them and they explain their creed, "one man, one vote, no matter how much money he may have brought to the enterprise." How different from the misnamed co-operative apartments which are springing up all over, and in which half of the occupants are stockholders and the other half tenants, with a real-estate firm to "manage" them. And so it came about in the South Brooklyn apartment that one chap with only five hundred dollars had as much say about the dwelling as another who had supplied twelve times as much. When asked about this, the co-operators answer: "Why should he not?"

There is a charm about this multifamily dwelling that is not discernible in the bricks and mortar. It comes from the character of these souls that trust and respect their friends and neighbors. Co-operation cannot be assumed lightly like the flinging on of a mantle, nor can it be superimposed. It is a deep and fundamental thing. Where is there any beauty in life, even in one's own individual castle upon one's own individual lot, if there is not accord with our neighbor on the right and left and front and rear? This is all too seldom the case in our suburbs, with all of their wealth and exterior beauty.

These co-operators were trained in co-operation in a foreign land, and for them co-operation is akin to religion. It would not seem to be a sound policy of Americanization if we should attempt to turn these more recent arrivals into sordid individualists. The future greatness of America will be built by learning from them and by incorporating into our national life much of their spirit.

Very truly yours,

HENRY ATTERBURY SMITH.

Announcements

We are in receipt of a letter from Mr. H. Van Buren Magonigle from which we quote the following regarding his reported comment on the Bahai Temple published in our June issue:

"I did say that I had never seen anything quite like it; that it was referable to no style with which I am familiar, but it seemed to belong to the school of which Louis Sullivan is the leader and chief exponent; I also said that I should like to see 'how it would work out in execution,' and when executed I strongly advised that the upper part be revolved on the central axis so as to bring the apparent thrusts of the upper buttresses to the angles of the lowest story instead of over the voids."

G. C. Freeman, architect, announces the removal of his office from 1111 North 11th Street to the Reading Liberty Bank Building, opposite the Court House, Reading, Pa.

Brentwood S. Tolan, architect, Rooms 316–317 Farmers Trust Building, Fort Wayne, Ind., announces that he has re-established his office at Fort Wayne, Ind., and that he will be pleased to receive catalogue and samples.

Grosvenor Atterbury, Stowe Phelps, and John Tompkins announce the removal of their architectural offices to 139 East 53d Street, New York City.

We are in receipt of "The Dunham Hand Book No. 114, The Dunham Heating Service, Chicago," a little reference of practical service to all interested in heating problems, and one that architects will be glad to have available.

We also wish to acknowledge the receipt of the booklet on "Quarter Turn Padding Lock Valves," published by Gorton & Lidgerwood Co., New York.

St. Thomas Acknowledges Our Lord. Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

The Recognition of the Risen Christ by St. Thomas.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

Central Panel of the Cross, with Adoring Angels. Originally Designed by Saint-Gaudens. Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

St. James and St. Andrew, Either Side of the Canopy Over the Cross.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

Our Lord with St. Mary and St. John, Immediately Over the Cross. Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

A Group of Apostles. At Right-Hand Corner, Bishop Tuttle, of Missouri.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

Two Missionary Bishops: Bishop Selwyn, Primate of New Zealand, and Bishop Patterson, of Melanesia. Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

St. Philip and St. James the Less.

St. Matthew and St. Mark.

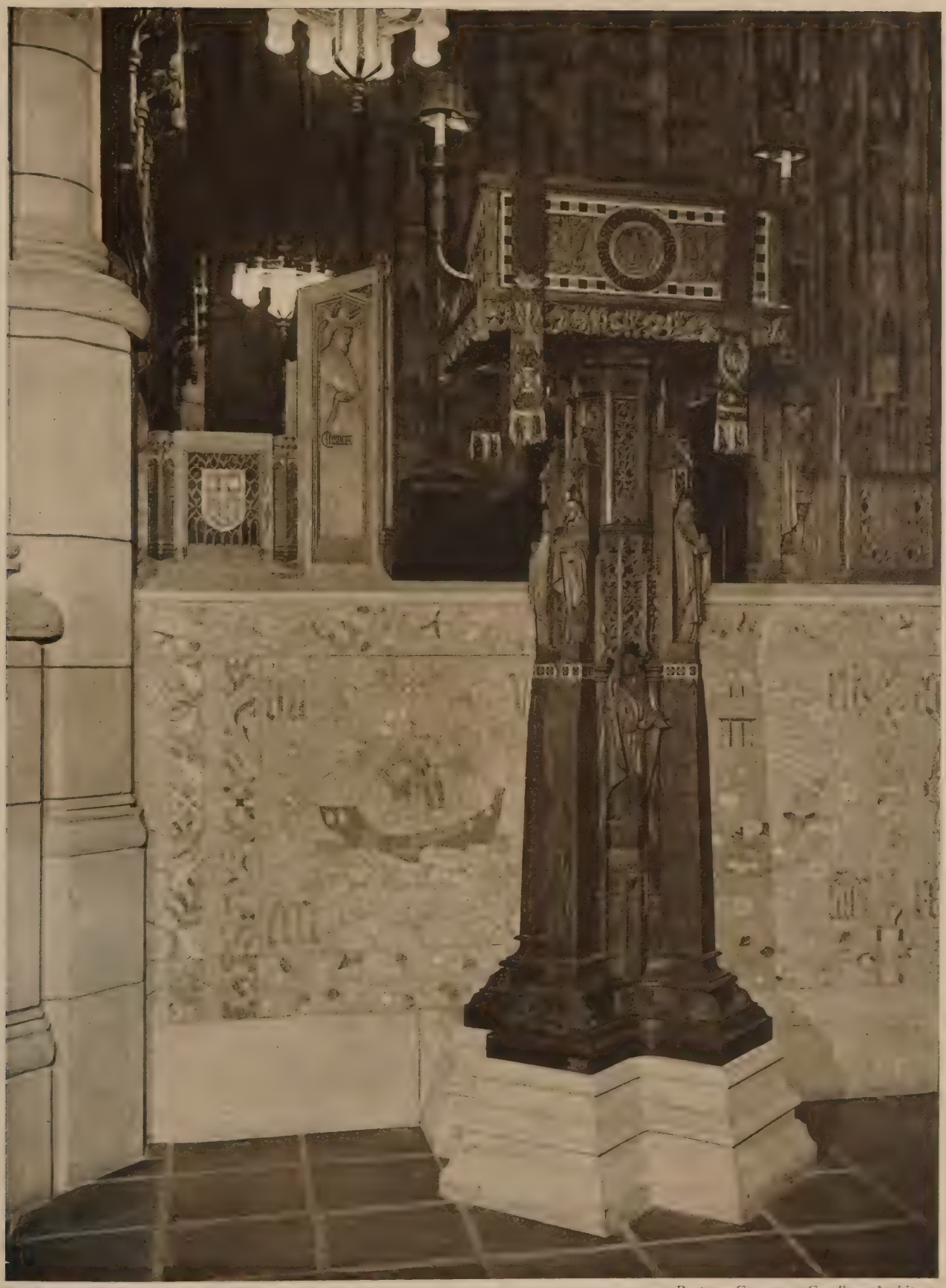
Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

The Pulpit and Rector's Stall.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.



The Lectern. Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

The Bishop's and Priests' Seats.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

Sedilia.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

Front of the Kneeler, Assistant Rector's Stall.

Back of Assistant Rector's Seat.

Bertram Grosvenor Goodhue, Architect.

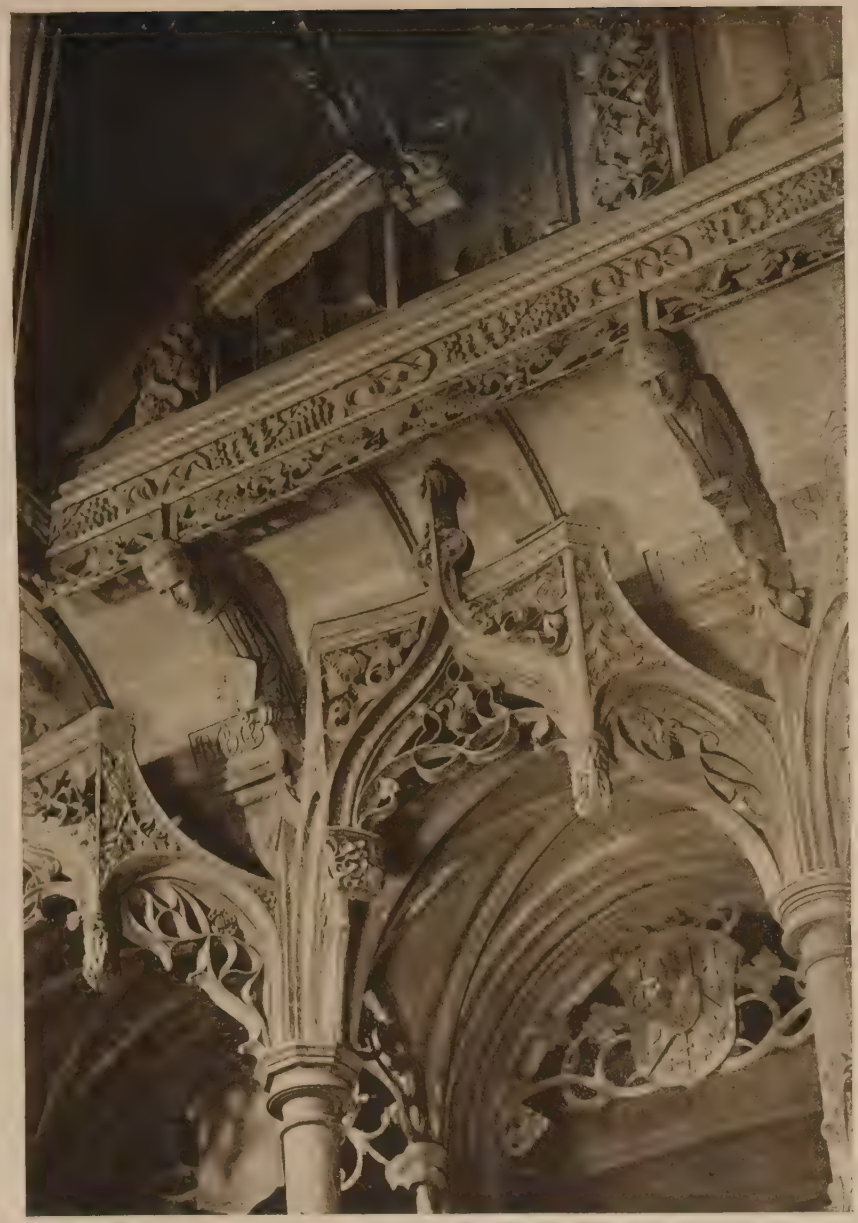
REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

End of Choir-Stall.

End of Choir-Stall.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.



One of the Canopies of the Stalls. The Rector and the Architect.

Back of Rector's Stall. Bertram Grosvenor Goodhue, Architect.

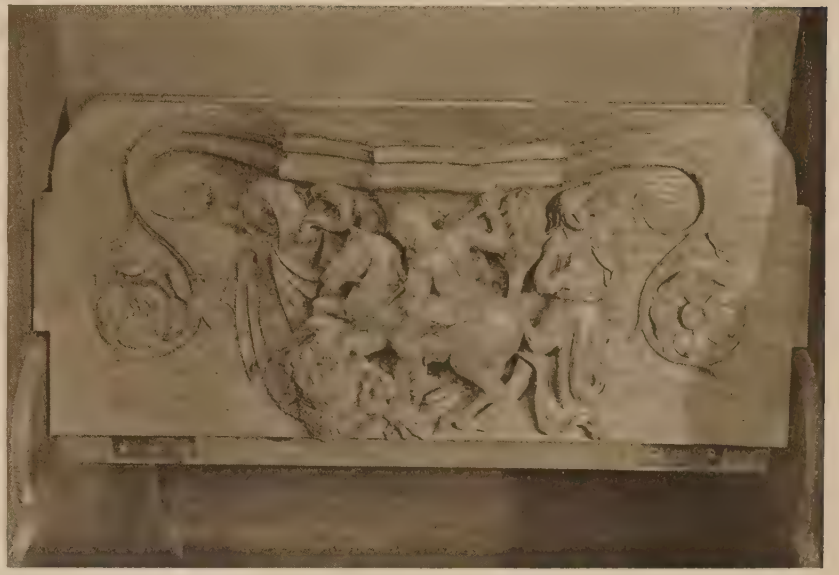
REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.

Crossing the Red Sea.

Adam and Eve Expelled.

The Fronts of the Kneelers of the Clergy Stalls.

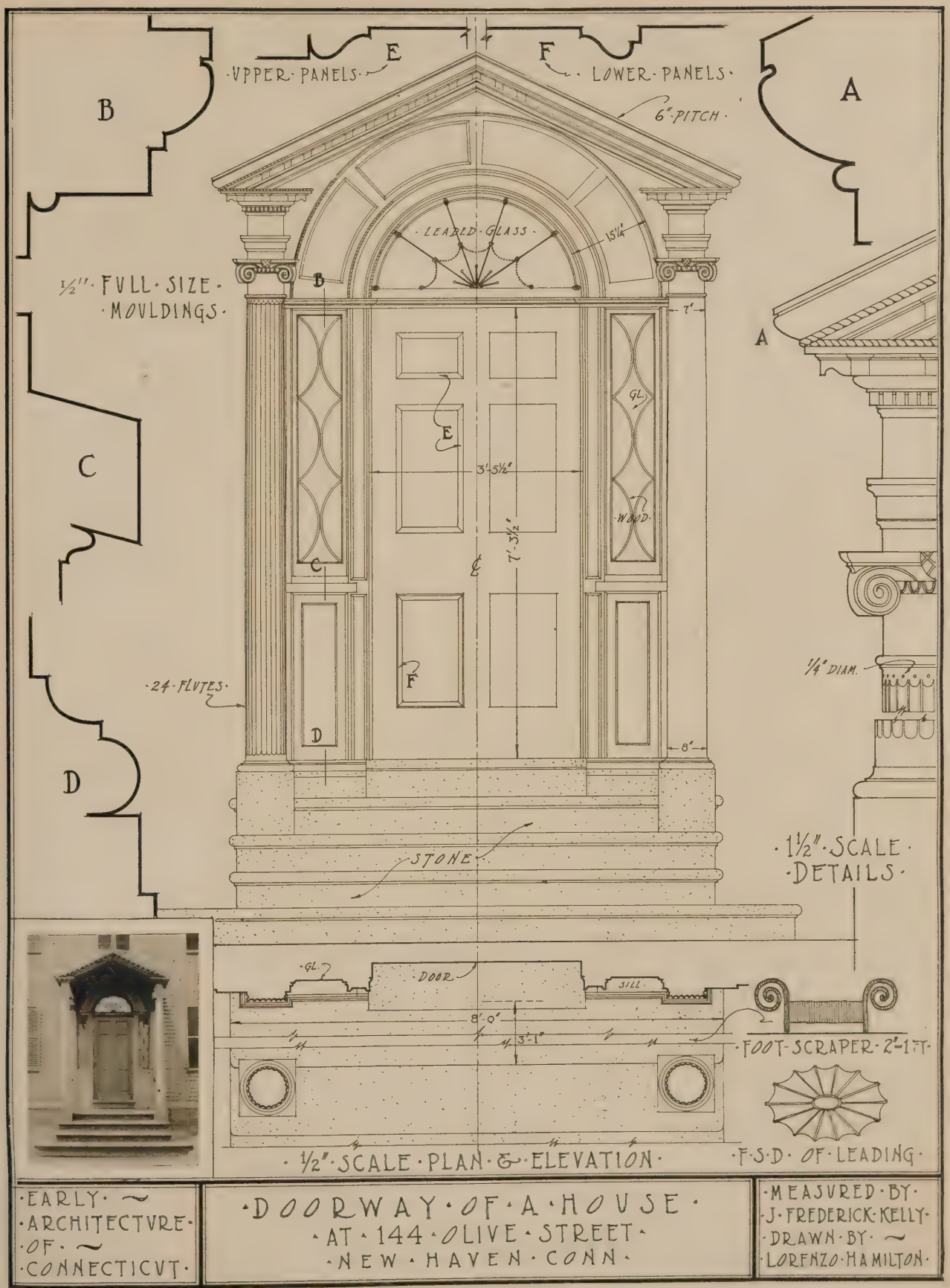
Miserere—St. Christopher, Patron of Travellers.



Miserere—St. George and the Dragon.

Bertram Grosvenor Goodhue, Architect.

REREDOS AND CHANCEL, ST. THOMAS'S CHURCH, NEW YORK.


B
E
F
A
·UPPER·PANELS·
·LOWER·PANELS·
6"·PITCH·
·LEADED·GLASS·
15¼"
½"·FULL·SIZE·
·MOULDINGS·
B
7'
A
GL.
C
E
3'-5½"
WOOD
7'-3½"
C
·24·FLUTES·
F
D
8'
D
1/4" DIAM.
STONE
·1½"·SCALE·
·DETAILS·
GL.
·DOOR·
SILL
8'-0"
3'-1"
·FOOT-SCRAPER·2'-1"·
·½"·SCALE·PLAN·&·ELEVATION·
·F·S·D·OF·LEADING·
·EARLY·~
·ARCHITECTURE·
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·CONNECTICUT·
·DOORWAY·OF·A·HOUSE·
·AT·144·OLIVE·STREET·
·NEW·HAVEN·CONN·
·MEASURED·BY·
·J·FREDERICK·KELLY·
·DRAWN·BY·~
·LORENZO·HAMILTON·

The Module System in Architectural Design

From a book in preparation by the author on "Economic Design and Construction of Small Houses"

By Ernest Flagg, Architect

DESIGN by the use of a modulous, or fixed measure, is evidently of very ancient origin; but not much used now, and one hears little of the module except in connection with the architectural orders.

My own attention was first called to the desirability of this method of planning almost by accident. While working on a design when a pupil at the Ecole des Beaux Arts in Paris, it occurred to me to save time and trouble by drawing in the axis lines all at once. When that was done, the paper was covered by squares, so nearly of a uniform size, that I determined to make them uniform and see what would happen. This necessitated a number of slight changes in the design, which to my surprise seemed greatly to improve it; and the thought suggested itself, that perhaps this uniform measure, pervading all parts of the composition, and simplifying it, might, if properly used, serve like time in music to give that harmony of proportion for which I was otherwise blindly groping. And is it not reasonable to suppose that this may be so, for what is artistic proportion but harmony of dimensions? It seemed to me that the slight correction of what had been drawn, to fit it to the fixed unit which now governed, added charm which was otherwise lacking; and I have repeatedly noticed the same effect in subsequent work. As in music, even the unskilled ear may be offended by a mistake in time, without discerning the cause; may not also a mistake in the harmony of dimensions unconsciously offend us in design?

Having become convinced that the principle was right, I determined to use it as soon as an occasion should offer. That came in the very first building for which I was architect—St. Luke's Hospital, New York. From calculations I found that a convenient module in this instance would be 2′ 2¾″, and upon that unit the entire plan depends, from its layout on the ground to the spacing of the modillions of the cornice. In marking the modules by the modillions, I thought with some pride and satisfaction that they might serve to indicate the harmonic scale of the plan, and show how I had obtained the good proportions which I fondly believed the buildings in some measure possessed, but the module was not used for heights.

The second building in which I was able to use the system was the Corcoran Gallery of Art, Washington, D. C. Here the module was 3′ 6″. I marked the module lines on the structure, by the points on the chéaneau, and the short pilasters between the pierced panels of the *claustra* mark every second module. At that time, before I had learned what a small estimate would be placed on my work, and filled with the enthusiasm of youth, I wondered whether the meaning of this harmonic record might not some day be recognized.

Since then I have used the system in buildings, public and private, for hospitals, churches, warehouses, office-buildings, hotels, mansions, and cottages. Even for tenements it has worked well, and plans for several large groups of model fireproof tenements were made in this way. In the Naval Academy at Annapolis the module is 8′ 4″ and that unit governs both the plans of the buildings themselves and their arrangement on the grounds.

I mention all this simply to show the adaptability of the system for all sorts of buildings, and my experience in its use.

For the last two or three years I have been engaged in the preparation of a book on the economic design and construction of small houses—the result of many years of study and experiment in that field. The work will consist of a number of essays, each dealing with a particular point in construction or design, of which this module system of planning is one, and also of drawings explanatory of the processes used and the results obtained.

There are more than sixty designs, each representing a different type of plan, or a very important modification of a common type. Here, then, in a restricted programme, that of a small house with the ordinary accommodations, there is great variety of treatment; yet the same module governs throughout, both horizontally and vertically.

I have used the module system in planning so long that I have become well acquainted with its properties. I think I realize both the advantages and danger in its use. Like fire, it is a good servant, but a bad master. The danger is that it may lead to a cramped and mechanical design. One may easily become a slave to the module, and do things because of it, which his taste or reason would not otherwise commend. The advantages in its use are great. It is the easiest and surest way of obtaining harmony of dimensions and commensurability in all parts of the design. It is the simplest way of designing, and the most convenient and economical in execution. How can the danger in its use be avoided and the benefits secured?

It was only quite recently, while examining Laloux's restoration of Olympia, that the thought flashed on me as to what might be the true meaning of the Greek triglyphs. Did they not indicate the module used? Were they not the record of the harmonic scale of the monument? Had not these buildings been designed by the same method I had for so long been using? And had not the builders marked their scale on the work, just as I had marked mine, and for the same reasons?

When I had drawn out the plans of several of these buildings, having first ruled the sheets with the module lines as indicated by the triglyphs, I had no doubt that this conjecture was correct. What was my surprise and satisfaction to find that methods which I had by long practice found to be best, were apparently the very ones used; and also to find that the one danger, which I had always recognized and supposed inherent in the system, was, by a very simple expedient which I had never thought of, completely removed.

I know from my own experience that when one uses a module in architectural design in the manner described, the temptation to indicate it on the structure is almost irresistible. It is the natural thing to do. One does it almost instinctively, and in looking back over my own work I find that in every instance where this system was used, in some way, the imprint of the module appears on the building, and I am firmly convinced that a Greek architect of the great epoch would no more have thought of omitting the mark of the harmonic scale of proportion, on which the design was based, than would the composer of music think of omitting the harmonic scale of his composition.

If one will take the plan of any ancient Greek Doric temple and draw lines through it in both directions from the centres of the triglyphs, he will see that the lines so made undoubtedly formed the basis of the design. He will also see that in general care has been taken by the designer to use the lines rather than their intersections. While the module lines govern, their points of intersection are for the most part avoided. With the Greeks it was not a system of ordinates. Thus all danger of a cramped or mechanical plan was completely removed.

In peripteral buildings the outside of the lateral walls of the cella generally follow very closely the third module lines. The main columns never stand at the intersection of the module lines, and it was probably to avoid such intersections that the end intercolumniations differ from the others. In the most ancient example, the Heræum at Olympia, the module lines of the main order govern inside the cella also, but in later buildings it often happens that an auxiliary module is used for the interior, which coincides only at a certain point or at points with the main one. In the Parthenon there seems to have been more than one of these auxiliary scales, and even the second row of columns at the ends are arranged by some method which is not clear. Apparently the inside face of their architrave runs on the fourth module line.

Most peripteral Doric temples may be classed by the placing and ending of the lateral walls of the cella, as follows:

Placing:

1. Face of wall on a module line.
2. Wall centred on a module line.

Ending:

1. Both ends terminate about in line with columns in antis centred on a module line; either transverse or longitudinal.
   Note.—If centred on one they are often off the other; apparently to avoid an intersection. Sometimes they are off both.
2. Both ends terminate on a module line.
3. One end terminates in the first of these two last-mentioned ways and the other in the second.

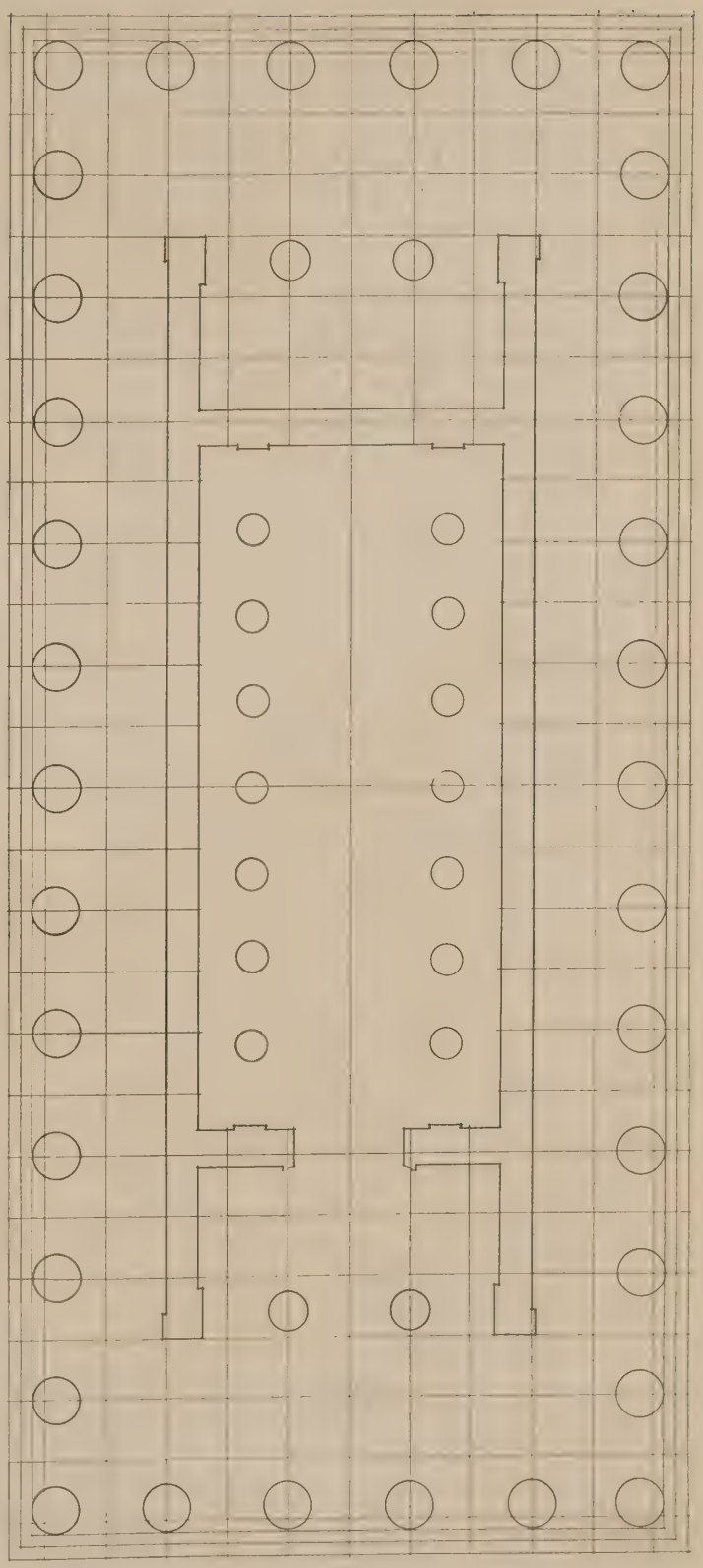
This permits of six possible arrangements of wall, as follows:

A. Face on a module line; both ends stop on a module line.
B. Centred " " " " " " " " "
C. Face " " " " " " with columns in antis.
D. Centred " " " " " " " " "
E. Face " " " } one end stops on a module line and the other end with columns in antis centred on a module line.
F. Centred " " " }

Examples:

Heræum at Olympia	A
Metroum at Olympia	A
Temple of Zeus at Olympia	A
Temple at Selinus (designated C by Koldeway)	A
Parthenon at Athens	A
Temple of Nemesis at Sunium	B
Temple at Ramnus	D
Temples at Selinus (designated A and O by Koldeway)	C
Temple at Pæstum (Neptune)	E
Temple at Pæstum (Basilica)	C
Temple of Theseus at Athens	E
Temple of Hera, Selinus	E
Temple at Epidarus	E
Temple of Jupiter at Ægina	*F
Temple at Bassæ	C
Temple of Juno, Agrigentum	E
Temple at Syracuse (Cathedral)	D
Temple of Concord, Agrigentum	E
Temple of Hercules, Agrigentum	C

*Note.—This temple is irregular in that the module line is neither on the face of the wall nor at its centre, but 6 inches inside the face.



Module Lines of the Temple of Zeus at Olympia

About one hundred years ago L. N. L. Durand, professor of architecture at the Polytechnic School, Paris, well known as the compiler of the "Récueil et Parallèls des Édifice de Tout Genre," wrote his "Précis d'Architecture," setting forth the advantages of this method of planning, but he did not deal with the danger in its use, and so far was he from realizing that the triglyphs had any bearing on the theory he was expounding, that he refers to them as useless, having no meaning and no resemblance to anything, or at least to anything reasonable.

Vitruvious tells us that triglyphs represented the ends of beams, but if so, why do they appear at the ends of the building?* He tells us other things which the buildings themselves do not confirm. He says the modulous of the order lies in the lower diameter of the column; but the buildings show this to be a mistake. Acting on the information given by him, many attempts have been made to apply his theory, but it cannot be done; not only do no two examples agree, but the diameters of the columns of the same row vary, the angle ones being larger; a fact which he seems not to have known. On the other hand, the principle of the practically uniform spacing of triglyphs in each specimen never changed.

Vitruvious lived four hundred years after the great epoch of Greek art, and much may be lost during four hundred years in a time of decadence. It is only one hundred years since we had a true and living national style of architecture in this country; but how completely have been forgotten the principles and methods which enabled the housewrights and carpenters, who acted as architects, to produce the beautiful specimens of architecture with which the country at one time abounded. It may well have been that in the time of Vitruvious the ancient art of the Greeks had given place to mathematical formulæ, or rules of thumb of the kind he explains, but that the method was not used by the Greeks in the time of Pericles existing buildings prove.

A building depending for its proportions on some unit of measure must necessarily have all parts proportional. It is therefore possible to find a modulous in almost any member, but whether a similar modulous from a second building will agree in its application with the first depends upon whether the proportions of the parts so taken as a modulous were obtained by the same method in both cases.

Vitruvious and the architects of his time, if they agreed with him, were peculiarly unfortunate in the selection of the part chosen as a modulous, because the shape of the column, more than that of almost any other feature, underwent constant change, from Corinth to Cora. In other words, their proportions were not obtained by the same method, whereas the principle of the uniform spacing of the triglyphs in every building never changed.

The use of a fixed measure in design is at once the simplest, easiest, and most natural way of obtaining proportionality and commensurability. Such a system is in direct harmony with what we know of Greek art, which was direct and simple in all its ways. Whatever methods the Greeks may have used in determining the minor proportions of the order, after the main ones had been fixed by the spacing of the triglyphs, whether by the eye or by a mathematical formula, as Vitruvious would have us believe, it is certain, from the testimony of the buildings themselves, that the main proportions, both for plan and order, depended absolutely upon the spacing of the triglyphs. They constitute, therefore, a modulous for the design, which never varies in its application. Moreover, the extraordinary pains which the builders invariably took to mark the buildings in this way seems to show that they intended this fact to be known. In making the plan and laying out the work, they probably used the module lines in some very simple way, which might easily be discovered if investigators would abandon their vain attempts to fit the buildings to the Vitruvian module, and turn their attention to this.

As has been said, the outer face of walls generally follows the module lines. It is much easier and simpler to lay out work in that way than to centre the wall on a line. Perhaps the half module lines, which were also marked on the building by the mutules over the metopes, were also used. I have found it convenient to do so.

It will be seen from all this that the plan is certainly determined in its most important parts by these module lines. In what other way, if any, they affect its minor details can only be determined by further study. When it comes to the order, however, it is immediately apparent that the module lines govern absolutely. The spacing of the triglyphs fixes the size of the metopes, which were square, and upon which the size of both frieze and architrave depend. The cornice must, of course, bear a proper relationship to these members, and the columns to what they support; thus the proportions of the whole order depend absolutely on the spacing of the triglyphs, and that spacing cannot be changed in the slightest degree without changing every dimension, both of plan and order. It is therefore the primary unit governing the design, the first dimension to be fixed after the general size of the building has been determined, and the one upon which all other dimensions depend; it is most natural, therefore, that it should appear on the work.

If this is all true, then the meaning of the triglyphs is perfectly clear; the measure which they mark constitutes the harmonic scale of the design, and as such is most important. Their presence and prominence are thus abundantly explained.

And why is not this hypothesis reasonable? Has any other for which this can be said, ever been advanced? Why were these strong markings invariably placed on the buildings? They must have meant something—everything else in Greek art has its meaning. Moreover, they must have had what the Greeks thought a very important meaning, and we know that the Greeks thought nothing more important than harmony of proportion. So true is this that the use of triglyphs with the main order is invariable, and if for any reason they were omitted elsewhere, as, for instance, to permit of a continuous band of sculpture, the places where they belonged were carefully indicated by the base and guttæ.

Could there be a more striking or amusing contrast between Greek art and subsequent art than this use of triglyphs by the Greeks and the senseless ape-like use of them by their successors; of whom Vitruvious was a shining light?

This theory of the meaning and use of triglyphs is not founded on elaborate mathematical calculations, but is so simple that any one may test its truth. Little respect is due to theories of the other sort when applied to architecture. They prove too much and are too easy to find. Many wonderful things may be found in almost any geometric design. I once took the elevation of an ordinary New York tenement-house, which had certainly been designed on no very elaborate theory, and tried fitting circles and triangles to it and drawing mathematical deductions therefrom. I found the possibilities almost limitless and

* This theory evidently belongs with the one which finds the origin of Gothic piers and arches in the trunks and spreading branches of trees.

that theories without number might be set up and demonstrated. It is therefore safe to conclude that one who adopts such methods to discover the hidden mysteries of ancient designs is likely to deceive himself.

In testing this theory doubtless many hair-splitting irregularities will be pointed out; it is well understood that they exist, but they do not affect its correctness. The Greeks were men of sense; if they used the system they did so for a purpose, as artists rather than as mathematicians, and imperceptible irregularities could not affect that purpose.

Here, then, is the solution of an archæological problem of the very first order—a mystery of the ages. Grecian Doric temples represent the supreme examples of art on earth; in which taste was carried to heights never since approached. It is not surprising therefore to find methods used in their design which were unknown to subsequent art.

It has been well said: the Parthenon stands as a reproach to the rest of the world. May not that be because the rest of the world has forgotten or never knew the principles which made the Parthenon possible and of which harmony of proportion as the Greeks understood it was one?

If the Greeks used this system in their buildings of the Doric order—the most ancient of all—is it not likely they used it with the other orders? Be this as it may, there has always seemed to me sound reasons for using the module system in architectural design.

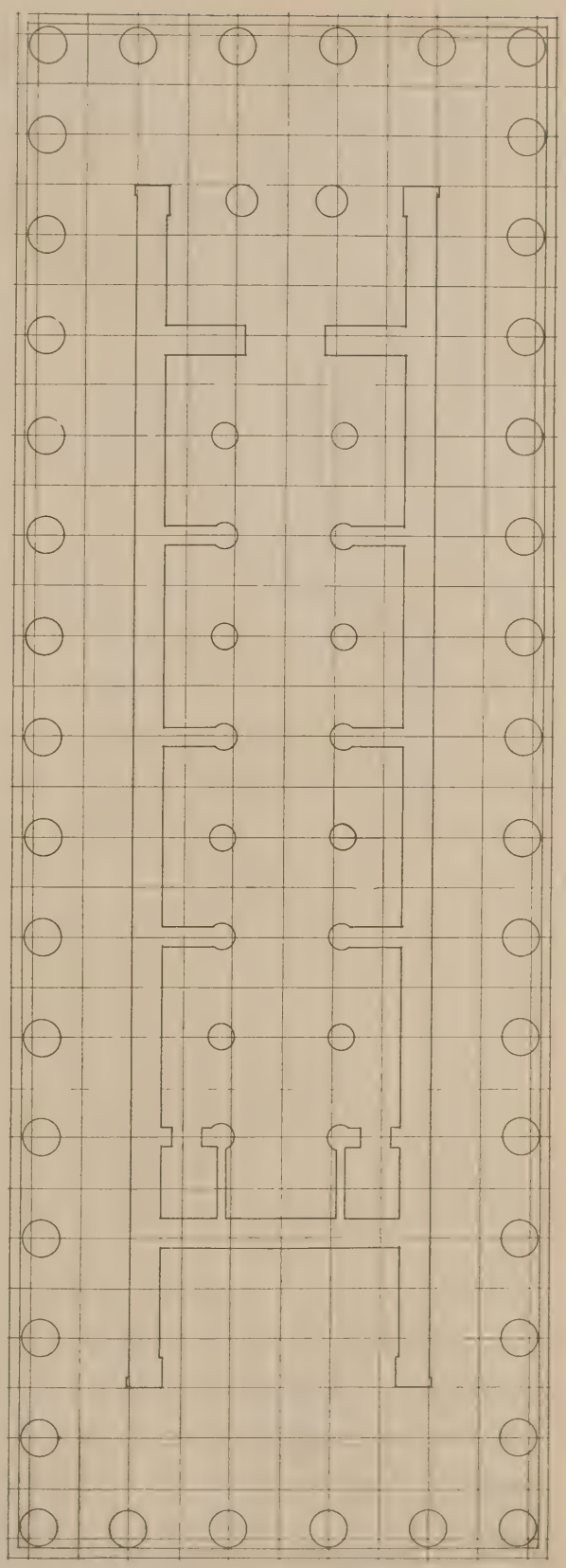
By this method practically all figuring of plans and all liability of error, so far as the plans concerned, are avoided. As I use it, one side of all walls (generally the inside) runs on the module line, and most partitions are centred on it, as are doors, window, and other openings. If for any reason a departure is made from this rule, then it is only necessary to give the distance to the nearest module line.

In the plans for the little houses above referred to, the module is 3′ 9″, divided into five parts of 9″ each. For the working drawings the sheets are ruled to show both the module lines and the parts. When drawings are made in this way, nothing is left to doubt; every dimension is fixed, and a mistake in one part will not affect other parts. Every necessary dimension is definitely shown on the drawing, yet few figures are used.

By the common method of making working drawings, it takes almost as long to figure the dimensions as to make the drawings themselves, and there is great liability of error; moreover, a mistake in one figure may cause mistakes in other figures. By the use of the module system the work of making the drawings is so simplified that it can be done by the architect himself, free hand, as these drawings are made, to the very great benefit of the design and at a great saving in time and cost.

In this country the general practice is to leave too much to the draftsman. By so doing the architect loses individuality in his work, and that is especially true of architects who have a large practice. Any system which may tend to give the architect more intimate control of his work and make it a profession rather than a business ought to be of benefit.

I was once told by an English architect, visiting this country, that the thing which most surprised him here was the large number of draftsmen employed in architects' offices. He said that in London the most prominent architects rarely have more than three draftsmen; and that every well-known architect of his acquaintance would never accept commission for more than one building a year, that being all he felt he could properly care for.



·MODULE·LINES·OF THE TEMPLE·OF HERA·AT OLYMPIA

A COLONIAL HOUSE. A. RAYMOND ELLIS, WEST HARTFORD, CONN. A. Raymond Ellis, Architect.

A Colonial House

By A. Raymond Ellis, Architect

OUR domestic architecture is developing a strong and interesting style truly American, due to a clearer and more forceful interpretation and expression of some of our early Colonial types which have filled so many architects with an inspiration to strive to maintain the charm and simplicity of plan and design that the early Colonial possessed. Much of this was gained by good proportion and simple architectural detail. The architectural publications are in a large measure responsible for this, because the improvement and certain characteristics are to be seen plainly in the work of the younger men, who evidently have drawn ideas and their inspiration from these published works. This is clearly shown by the rapid development of the elongated plan, with extended front or with a wing at each end or at an angle. The treatment of these wings is noticeably interesting in many of the newer houses of Colonial type. The simplicity of the front elevation is accented by the simple and well-proportioned front entrance, which is usually an exact reproduction of an old one.

In the house shown here, the front hall is 10′ 6″ x 15′ 6″, painted cream-white, with a low wainscot and the walls above laid off in panels formed by mouldings. The staircase is very pleasing with its slender balusters and ramped mahogany rail. Under the stairs is a coat closet and lavatory. Through an arched entrance at the end of the hall, the den, 10′ 6″ x 10′ 6″, is reached. This room, while connecting with hall and living-room, is essentially a workroom. It has been decorated to harmonize with the other rooms, and is painted a beige or brownish color. The group of windows across the east end are used to avoid the confining feeling one gets from unbroken walls. At each side are bookcases with doors glazed with mirrors, making this end of the room have the appearance of being a deep bay window. The living-room at the right of the hall is 14′ x 27′ 6″, with a fireplace on the south wall. This room has a low wainscot, lining with the window-sills, and the walls above are laid off in panels formed by mouldings on the walls. The room has a simple cornice, and the fireplace mantel covers the whole breast with panelled sides. French doors open onto the piazza, which is enclosed with glazed sash; and from the piazza, doors open onto the flag-paved pergola.

On the left of the hall is the dining-room, 14′ x 15′, with an alcove for the sideboard. This room has a wainscot, lining with the window stools, and above, the walls are laid off in panels formed by mouldings, repeating in fact the scheme of decoration in hall and living-room. From the dining-room there is a serving-room 6′ 9″ x 10′ 6″, containing a butler's sink, glazed cases, cupboards, and drawers. Off the kitchen is a pantry 5′ x 6′, on the north, containing a refrigerator with a door in the wall to the porch so that it can be iced from the porch. The kitchen is 11′ x 13′ and contains an enamel'ed iron sink with drain boards, an electric range; and has a chair-rail 3′ high. The plaster walls are painted and the floor has a sanitary base. The rear hall is between the kitchen and the front hall, and contains the service stairs and broom closet. This is very convenient, as they may be used by family or maids in going to cellar or attic without entering the kitchen.

The second-floor hall is planned so that it may be used as a sitting-room, or a place to sew in. The open stair well forms a gallery that makes it attractive and unusual.

The owner's chamber is 14′ x 20′ 6″, with two large closets and a fireplace with Colonial mantel and an English hob-grate. This side of the house is quite conveniently arranged for the owner, and the chamber over the piazza which is 10′ 6″ x 18′ 0″ is used as a sleeping-porch or chamber. A small dressing-room separates the owner's chamber from the bathroom, and through it a small east chamber, 10′ 6″ x 11′ 0″, can be reached and used en suite, or shut off from the owner's rooms. This would be very convenient for a nursery. The sleeping-chamber windows are so placed that plenty of air can be obtained without a draft. The chamber over the dining-room is 13′ 6″ x 14′ 0″; the north chamber is 10′ 6″ x 18′ 0″. Both are near the guests' bathroom. Off the second-floor corridor is a large linen closet and a door to the service staircase.

In the attic there are two large chambers, two storerooms, and the maids' bathroom. In the cellar there is the laundry, vegetable closet, toilet-room, heater, and coal-bins, and hatchway to yard. The heater for the garage is also in the cellar with the pipes carried underground to it.

The house is of frame construction, with the exterior walls covered with 24″ split cypress shingles, laid about 10″ to the weather in order to carry out the early Colonial feeling. The blinds are painted green. The interior of the house is painted old ivory in the principal rooms, and buff in the service portion; the floors in all principal rooms are oak, and those in the service portion are hard pine.

This house is the residence of the architect. The plan was developed with the particular purpose of affording a house, without any wasted space or useless ornamental features, that could be built for a reasonable amount in these times when the cost of building is at its highest and likely to be still higher.

The Certosa of Pavia

By Frank Jewett Mather, Jr.

II

OUR theme is the Certosa of Pavia, not Ambrogio Borgognone, that incomparable painter of the divine Girl Mother. Otherwise I should tell you how, outliving Raphael and witnessing the exuberance of the high Renaissance, he continued to make those lovely panels, timid, reserved, devout, perfect in tone, which now one sees best in the Brera Gallery. At the Certosa one has still refreshing bits of him in their original places over doors, besides precious fragments transferred from the cells to redeem some of the worst chapels. The great frescoes in the transept, and the important altarpieces of St. Ambrose Enthroned and the Crucifixion hardly represent his intimate quality. But the loss is slight, for, by some magic, defying analysis, and with a power only given to the great decorator, he has diffused this intimate spirit, this serene sense of worship, through the monumental spaces of the temple.

The church from the little cloister.

To many the finer meaning of the Certosa will be bound up with the work of the Lombard Fra Angelico. We may be sure the easy-going monks took no such view. If we would realize their attitude we must not dwell too long upon the place where they mumbled perfunctory litanies, but must rather consider the cells in which they lived and the routine of their contemplative days. Like so many of the offshoots from the great parent order of St. Benedict, the Carthusians found the average monastic life, the necessary sociability of refectory and corridored dormitory, unfavorable to contemplation and austere discipline. Accordingly each monk had his detached cell, an independent establishment comprising four rooms, a loggia, a well, and a garden—all deliciously clean and comfortable. To spare him needless talk and contacts, his food was passed in through a turnstile that concealed the caterer. His duties, aside from those of the ritual and frequent prescribed prayer, were to cultivate his garden, pursue such studies as he chose, and do the business of the monastery. Surely the self-denying life was seldom led more agreeably. A host of retainers were necessary to guard these ascetics from the cares of the world; nobody guarded them from the deceitfulness of riches. We may imagine the bland satisfaction with which they walked the great cloister, gravely saluting each other, identify themselves, the saints and the conquerors of this world proudly wrought in terra-cotta above the arches, and all enlivened by flying loves in the prettiest taste of the time. And if such recreation savored too much of the world and the flesh, it might readily be corrected by pensive consideration of the velvety quadrangle already spotted by the funeral tablets of earlier inheritors of this ease. To such thoughts the incessant picking about the workshops and the façade must have played a grateful undertone. The day was nearing when their monastery should seem the most splendid in Europe, and the day

The church, from the great cloister, upon which open the cells—the library and other monastic buildings between.

when Gian Galeazzo's ducats must be distributed to the distant, unappealing poor was being indefinitely postponed. Surely the ascetic life had its features at the Certosa of Pavia. The Sieur de Montaigne, who enjoyed its hospitality in 1581, was chiefly impressed by the number of "servants, horses, equipages, workmen, and artists" about the place.

Since that time the Certosa has received many famous guests, but none that the imagination more willingly revives than Francis I, captive. He had beset Pavia, where he hoped to seize his most formidable foe, the Viceroy Constable Bourbon. A mutiny among the unpaid mercenaries of the Constable suddenly reversed the situation. The sortie took place at night and threw the French into confusion. Through the cowardice, or worse, of his hireling Swiss, the King, after a gallant struggle, was unhorsed and captured in the Emperor's name. From that night Charles V of Hapsburg fulfilled Gian Galeazzo's dream of an Italian overlordship. Pleading not to suffer the chagrin of imprisonment at Pavia, whose conquest he had confidently promised himself, Francis, so tradition asserts, was led to the Certosa. As he entered the monks happened to be chanting that most appropriate verse "*Coagulatum est, sicut lac, cor meum . . .*"; and he, with the readiness that never forsook him, joined in the response, "*Bonum mihi quia humiliasti me ut discam justificationes tuas.*" That night his captors, captivated by his bravery and good humor, served him at table with royal honors, and within a few days we hear of him playing contentedly at handball in his prison tower some miles away. One would be glad of his reflections during that brief stay at the Certosa. How would he have regarded this proud monument to a forgotten woman and a dynasty that had run its course? It may be that its famous embellishments seemed as unsubstantial as the golden spurs, the brocaded sleeve, and the reliquary necklace which, we read, certain base fellows among the Spaniards took from him the night before. Surely he must have envied for a moment the quiet, opulent dignity in which his Carthusian hosts rejoiced. At least the spectacle of so much unforfeitable wealth must have struck his ever-eager imagination.

He could hardly have foreseen the day when fate would play as ruthlessly with the monks as with their royal guest, and their halls, cells, and cloisters should stand empty, their temple devoid of psalmody, all as meaningless as the trophies, become mere curiosities, which the Emperor's hirelings had torn from the Most Christian King.

And yet to a philosophic spirit the Certosa retains a significance impersonal but profound, even now when psalmody no longer fills the church nor prayerful high-living the cells. The humble employees of the government who have replaced the proud monks, the rather painful neatness of a well-kept and much-restored national monument, the sense that the old wealth of pictures and plate has gone to remote museums and melting-pots—all this does not blunt the intuition of some larger meaning, one transcending the zeal of a monk, the fears of a gentlewoman, and the pride of a prince. For the Certosa, in the strange dualism we have noted in it, is an authentic embodiment of the artistic spirit of Lombardy. We have noted how, about a temple simple, spacious, excellently proportioned, discreetly adorned by an exquisite artist, there has been loaded an appalling mass of carved, painted, and incrusted ornament, all of it ingenious, some of it charmingly picturesque, but most of it superfluous. That contradiction is Lombardy.

From Rome the Milanese readily took over a paradoxical tradition: a love of spacious, logical, monumental building,

Terra-cotta relief of the little cloister.

The nave.

and a craving for inordinate decoration as an end in itself. To the first tendency we owe those admirable Romanesque and Gothic churches, domed and basilical, which merged naturally into Bramante's sublime invention of a poetry of enclosed space. To the second tendency, which was greatly reinforced by the Renaissance, we owe the façade of the Certosa, the mouldings of its cloisters, the external ornamentation of the Cathedral of Milan, in fine hundreds of northern palaces and churches, to adorn which tone and clay are so tortured and paint so insistently applied that the poor eye is fairly harried from the spot. In other words, the Lombards, by a whimsical fate, were ever striving for effects as architects, which they straightway weakened or even destroyed as decorators.

Go to Florentine Michelozzo's lovely chapel in St. Eustorgio, Milan, and study the wise subordination of its rich and characterful decoration to the general effect, and you will realize not merely how impossible it was that the Milanese should have done so fine a thing for themselves, but also certain radical distinctions between the Lombard and Tuscan taste. The Florentine artist came naturally by a reverence for a fine space. It seemed to him a thing so precious in itself that he must beware of obscuring it even by the most beautiful addition. To the Milanese artist before Bramante a fine space too often was merely a pocket into which as many costly objects as possible must be crammed. Florence perceived the reticent Greek originals behind the florid examples Rome furnished her, while Milan fairly outdid Rome herself in purple feats. In this, as in many other regards, Milan proved herself Rome's legitimate heir.

The reasons for this contrast would be matter for a book, not for the last paragraphs of a sketch. But may we not imagine both in the stately piles they raised and in the decoration they lavished unconscionably the reaction and protest of the Milanese against the monotony of their vast alluvial plain? Nature surely counts for much in these matters. We may fancy a Florentine architect dreading to cast a line less crisp than the outline of the distant Carrara mountains, less suave than the gently falling buttresses of the Apennines; fearing to arrange a space more crowded than the overlapping plains of the Chianti hills. And at Milan we may imagine an architect resenting the tameness of the green, unbroken plain, and stung to a hopeless emulation by the serried confusion of the distant Alps, striving to assert himself against both in such structures as the Cathedral at Milan and the Certosa of Pavia.

Lest I should seem to depreciate this potent people, at all times the political and industrial bulwark of Italy, I hasten to say that they and their buildings are strangely like ourselves and ours. I could show you fifty mansions and as many public buildings in New York that are Milanese, but will not. And if you will breathe the æsthetic air of Milan without the pains of a sea voyage, you have but to visit the Congressional Library at Washington. In both cases great pride and wealth and a common impatience of the more reflective and precious qualities of art have produced analogous effects. Even in our eclecticism, a natural tendency in a nation that can afford to pay, we are the followers of Milan and Rome. Milan had the good sense to send for Michelozzo and Leonardo, as Boston did for Puvis de Chavannes. Milan produced a Borgognone on her own account, and by a similar miracle Whistler was born one of us and found here encouragement for his exquisite talent. Milan culminated in Bramante, and I trust we are not more than literally culminating in the sky-scrapers that would contain most of his buildings.

But we have drifted far from Certosa. As memory seeks to harmonize its dissonances, the buoyant vaults traced with blue, the ample cloisters with slender columns straining under heavy mouldings, and finally that fair but false miracle the façade, all seem a proper expression of that Lombard spirit which drove men to build nobly only to decorate at random profusion; it all appears a fitting memorial of the pride of a monarch interpreted by an aristocratic order; even more, perhaps, since happily the finer impressions are the most permanent, it declares itself a monument to the sagacious architects who started the work and to

the admirable painter who so loyally respected their intention. For a last view of the Certosa in epitome go to the little cloister and pass to the far side, where across the garden close you may see the church drawing itself together, colonnade by colonnade, behind the light buttress pinnacles. Time has dealt gently with it all. The moss on the cloister tiles and the rank herbage below deepen the mellow reds of the bricks and mouldings. Deep shadows give relief to the loves and monks whose heads enliven the cloister arches and spandrels. From one of the Gothic corbels a fascinated monk listens to the promptings of the fiend in a woman's form. Toward him swings elatedly the lichened cupid who guards the fountain in the centre. In the far corner Giovanni Amadeo's little marble door, carved like the ivory frame of a jewel-casket, leads to Borgognone's realm, the transept. In such a spot nature has brought about a fusion. The confusingly ornate terra-cottas sink into flicker of light and shade, the graven door changes into an ivory gate of dreams, the temple becomes a towering warm thing, athwart which twinkling arcades draw velvety strips of shadow, the green of moss and lichens binds it all together, and, if there happens to be a gray Lombard sky, that gives to all the colors their most sonorous harmony, investing with a curious mystery the big, calculated pile. Under the touch of time and nature, those great reconcilers, the Lombard spirit seems no longer twain, but one.

Effigies of Lodovico il Moro and Beatrice d'Este by Andrea Solario—brought to the Certosa from S. Maria delle Grazée, Milan.

Book Reviews

"HELLENIC ARCHITECTURE, ITS GENESIS AND GROWTH." By Edward Bell, M.S., F.S.A. London: G. Bell & Sons. New York: The Macmillan Co.

The author of this little volume has done a service to the students of classical art in presenting in a brief form much of the information only available in special publications of societies and the results of recent archæological research. It is a logical and clearly written analysis of the origins of the classic orders. One of the best and most readable discussions of the subject that we have read.

The whole question of origins and racial influences is one of a more or less individual point of view, and the relative value of the influence of other civilizations upon Greek art must forever rest largely upon surmise. As the author well says: "An attempt to trace the history of architecture between the two great periods which are represented by the surviving monuments of Egypt and Hellas is necessarily, as the preceding pages have shown, a difficult undertaking involved in an obscurity which can never be altogether penetrated."

"THE STUDIO YEAR BOOK, 1920—THE FURNISHING AND DECORATION OF COTTAGES, SMALL HOUSES, AND FLATS." New York: The John Lane Co.

In addition to the interesting text and attractive illustrations in color on the main topic above, there are other chapters of especial interest on "Country Building and Handicraft in Ancient Cottages and Farmhouses," with sketches and plans for the architect; an article on "Concrete Homes," also with elevations and plans, and very fully illustrated chapters with many colored plates on "Decorative and Applied Art." The volume should be of interest to architects and all interested in the allied arts.

Announcements

Prix de Rome.—The American Academy in Rome announces that this year's competition in architecture for the Prix de Rome has been won by James Kellum Smith, of Towanda, Pa. The appointment is for three years. He will report in Rome October 1, 1920.

Mr. Smith is twenty-six years of age, a graduate of Amherst College. Last year he won the Stewardson Memorial Scholarship in Architecture in the State of Pennsylvania. He was a lieutenant in the Aviation Corps.

Black, Burris & Fiske, Inc., consulting landscape architects and foresters, announce that they have opened an office at 317 Broad Street, Bank Building, Trenton, N. J., for the practice of landscape architecture and landscape forestry. They would be interested in catalogues.

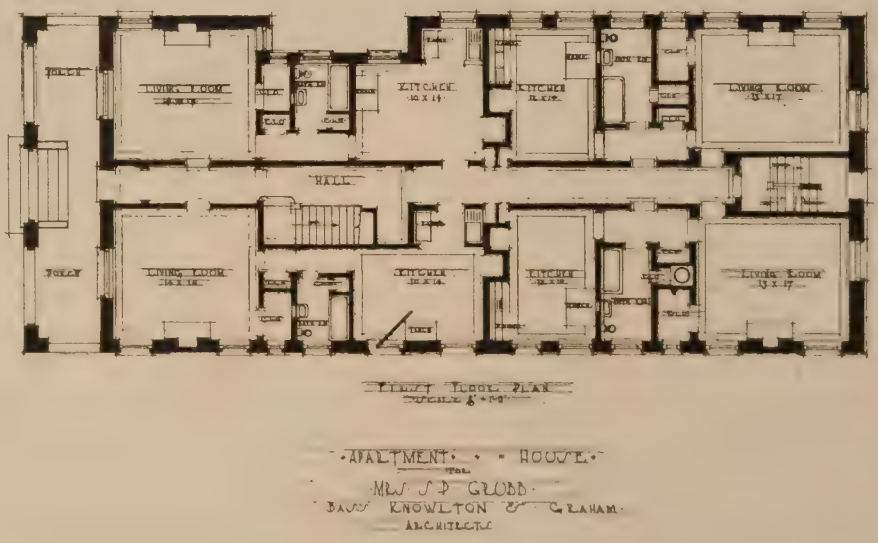
The architectural business conducted by M. Hawley McLanahan and Ralph B. Bencker under the firm name of Price & McLanahan will be continued from July 1, 1920, under the firm name of McLanahan & Bencker, Philadelphia, Pa.

The address of Rodger C. McCarl, architect and engineer, should have been 1012 Murchison Building, Wilmington, N. C., not Wilmington, Del.

The firm of Lee, MacEwan & Turnbull, architects and engineers, of Charlotte, N. C., is now Lee & Turnbull, Mr. MacEwan having withdrawn some time ago.

A. L. Thayer, architect, New Castle, Pa., and R. M. Johnson, formerly with Walker & Weeks, Cleveland, Ohio, announce their association for the practice of architecture under the firm name of Thayer & Johnson, with offices at 5716 Euclid Avenue, Cleveland, Ohio, and New Castle, Pa.

An interesting and valuable article discussing "Industrial Housing," written by Emile G. Perrot, of Ballinger & Perrot, that appeared in the May number of *General Fireproofing*, has been widely quoted. Mr. Perrot says *industrial housing lies in the eyes of industrial captains.*



APARTMENT HOUSE, INDIANAPOLIS, IND. Bass, Knowlton & Graham, Architects.

ADMINISTRATION BUILDING, MILK STREET, BOSTON, MASS.

BACK BAY CENTRAL OFFICE, BOSTON, MASS.. (Latest type central office.)

MEDFORD, MASS. (Small city office.)

CENTRAL OFFICE BUILDINGS OF VARIOUS TYPES, NEW ENGLAND TELEPHONE & TELEGRAPH CO.

Modern Building Superintendence

By David B. Emerson

CHAPTER XI

INSTALLING OF FIRE PROTECTION AND FITTING UP TURKISH BATH

DESPITE the fact that the building was of a strictly fire-resisting construction (practically no wood being used except for the cabinet work in the first story), the furniture and the contents of the offices was most of it combustible, therefore some fire protection was necessary. The local ordinances required stand-pipes in all buildings over four stories in height, and by making these and all of the equipment comply as nearly as possible with the regulations of the National Board of Fire Underwriters, low insurance rates on both the building and its contents was made possible. Four six-inch stand-pipes were located in the corridors and stair towers, so arranged that any point on any floor might be reached with a fifty-foot length of hose. The supply for the stand-pipes was taken off the discharge end of the fire pump, and it was cross-connected so that either the fire pump or the house pump, or both pumps could supply water in case of fire. The stand-pipes were of extra-heavy galvanized, puddled wrought-iron pipe, with extra-heavy cast-iron fittings.

A steel tank made up of one-quarter-inch plate, thoroughly riveted and caulked, and set up fifteen feet above the roof on steel supports, kept the stand-pipes full of water and provided a temporary supply until the pumps could be started. Branch lines were run from the supply line for stand-pipes, through the basement walls on both streets and terminated with Siamese-twin connections on the sidewalks, through which water from the street hydrants or the fire-engines could be forced into the system. These Siamese connections were of brass, with two-and-one-half-inch outlets, fitted with couplings the same as those used by the local fire department. They were fitted with swinging flap valves, which closed one opening when the pressure was applied to the other and stood open when water was forced through both openings. The caps on the Siamese connections were of galvanized iron, on account of the liability of brass caps being stolen.

The pipes for these sidewalk connections were fitted with iron body, soft seat, straight way swinging check-valves, which prevented the water which was supplied from one source being lost through the other outlets. Another check-valve in the line connected to the tank prevented the water from filling and overflowing the tank when the lines were supplied from the pumps or the Siamese connections on the sidewalks, and a check-valve was placed in the pump pipe to relieve the pump valves of the pressure of the water in the system.

The system was provided with emptying pipes three-quarters of an inch in diameter to drain the entire system, and drip-pipes were provided to empty and prevent water freezing in the pipe between the check-valves and the Siamese connections on the sidewalks. Two-and-one-half-inch outlets were provided on each stand-pipe in the basement and in each story of the building, fitted with quick-opening, gate-type hose valves. The stand-pipes had a short horizontal line directly under the roof, with a gate-valve in the line, with a long stem, the wheel handle being placed above the roof. From the horizontal line a riser ran through the roof, and was fitted with a two-and-one-half-inch hose connection. A drip-valve with a three-quarter-inch drain line was placed at the bottom of this riser. Each stand-pipe was fitted with a gate-valve, placed just above the ceiling. This valve was kept strapped open. All of the valves used on the stand-pipes had Babbitt metal seats, which allowed them to close tighter than those having hard metal seats and prevented any leakage of water.

The hose-valves on each story terminated in hose cabinets, which were set in the walls and finished flush with them. These cabinets were made up of No. 18-gauge steel, with frames and doors formed of No. 14-gauge steel, all finished in baked enamel, which matched the steel trim throughout the building. The doors had plate-glass panels, and they were fitted with bullet catches and pull-handles. Inside of the cabinets were swinging hose racks, each one fitted with fifty feet of two-and-one-half-inch Underwriter's unlined linen hose, with an Underwriter's play-pipe. This play-pipe was of aluminum bronzed iron, as brass play-pipes are constantly being stolen in public buildings, thereby rendering the fire protection ineffective. Unlined linen hose was used in preference to rubber-lined hose, as it is not affected by heat, is much lighter, occupies very much less space, does not require testing, does not deteriorate, and also it costs less. At each hose connection on the roof was set a fireproof hose-closet, made up of No. 20-gauge corrugated iron, with a steel angle frame, and fitted with slatted shelves and a rain-proof door. This closet was provided with fifty feet of rubber-lined cotton hose, one Underwriter's play-pipe, a Tabor pattern spanner, a lantern, a fire-axe, and a pick. The hose-closet was painted one coat of red lead and oil, both on the inside and the outside, and then painted two coats of white lead and oil of a gray shade.

The fire pump was located in the sub-basement, and was a three-stage turbine pump, with a capacity of five hundred gallons per minute, direct-connected to a seventy-five horse-power electric motor, with a gasolene-engine at the opposite end of the shaft, so that in case of any trouble with either the motor or the wiring, the coupling-pins could be removed from the motor coupling placed in the opposite end and the pump operated by the engine.

The building was equipped with stations for watchmen's portable clocks, having one station in the boiler-room, the rubbish-room, and machine-room, and one at each end of the corridors on each floor. The key-boxes in the sub-basement were of iron, aluminum finished, with lift covers. Those in the corridors were of the flush type, of bronze, finished to match the door hardware.

As soon as the construction work in the basement was finished, and the marble and tile workers had commenced work in the other parts of the building, the work of fitting up the Turkish bath in the basement was commenced. The swimming-pool was constructed of reinforced concrete, and lined with tile, with a combined scum gutter, life-rail, and overflow drain formed in the tile, and with a tile curb around the edges to prevent splashing. The scum gutter was provided with oblong bronze gratings, which were connected to two-inch wrought-iron pipes provided with running traps

(*Continued on page 220.*)

MANCHESTER, MASS., CENTRAL. (Season business. Typical North Shore office.)

NAHANT, MASS. (Small town office. Senator Lodge is served by this central.)

WELLESLEY, MASS., EXCHANGE. (Typical small town office.)

LINCOLN, MASS. (Suburban community.)

CENTRAL OFFICE BUILDINGS OF VARIOUS TYPES, NEW ENGLAND TELEPHONE & TELEGRAPH CO.

and discharging into the drainage system. The concrete shell for the swimming-pool was poured with the other concrete, and it was water-proof with a membrane water-proofing on the inside to prevent the leakage of the water. The water-proofing was given a protecting coat of cement mortar one inch thick, which was scratched to receive the floating coat. The floating coat was applied before the scratch coat had thoroughly set, and had an open-mesh metal lath bedded in it, to prevent the cracking of the tile. The tile was a ceramic mosaic tile, laid with a white field, and the depth marks, lines, etc., set in in black tile. The ceramic tile was used in preference to biscuit tile, as they are absolutely impervious, whereas biscuit tile are only impervious on the face, and any water getting behind the tile would do serious damage.

The pool was provided with built-in ladders of reinforced concrete, covered with tile, and set into recesses in the sides of the pool, so that there were no projections into the pool. The floors throughout the Turkish bath were of vitreous ceramic tile. The wainscot around the rooms, partitions around dressing-rooms, the partitions and tables in the shampoo-rooms, and the enclosures around the showers, were all of structural glass, the same as was used for the toilet-room partitions throughout the building.

The partitions around the Tepidarium and the Torridorium were of plate glass, double, with an air space between, set in white enamel steel frame work. The heating of the Tepidarium and the Torridorium was done by means of concealed pipe-coils, taking steam from the high-pressure boiler at ten pounds pressure, which gave a larger amount of heat than low-pressure steam would have given. Live steam was also furnished to the steam-room from this boiler. The baths were fitted with a hydriatic douche-room, with control table made up with structural glass sides and top, and fitted with thermostatic control mixing-valves and thermometers; nozzles and control-valves for supplying ice-water, hot and cold water, or steam, to the various fixtures and nozzles; needle and shower-bath, with pipe-trench fitted with perforated brass cover; and a porcelain seat bath with wave spray, built into the wall.

An electric-light bathroom was included in the equipment, and it had two forty-six light electric cabinets, made up with white enamelled exterior and the sides and back of the interior lined with mirrors. These cabinets were fitted with thermometers and had separate switches to control the lights in each section. The shampoo-room had shampoo fixtures, fitted with thermostatic mixing-valves, thermometers, rubber hose with cloth insertion, spray nozzles, and nickel-plated copper tilting basins, with brackets and stops. The swimming-pool was supplied with filtered and sterilized water. All of the water, before entering the pool, was heated, using a water-heater of the same type as was used for heating the water for use in the building; it then went through a pair of vertical pressure filters, then through an ultra-violet-ray sterilizer, and then into the pool. This method of sterilization is particularly efficient, destroying all forms of bacteria in the water. It adds no taste and no odor to the water, and gives no irritation to the bathers.

The pool had a recirculating pump, which drew the water from the pool, delivered it to the filters for clarification, and then to the sterilizer and back to the pool, so that the entire contents of the pool were recirculated, clarified, and sterilized once in every twelve hours. The sterilizer consisted of a cast-iron shell, made up in three sections, with proper baffle plates and a cylindrical clear quartz tube inserted in each section. Inside of these tubes, were placed mercury vapor arc-lamps, having a normal current consumption of about three-and-five-tenths amperes each. These lamps generated the ultra-violet rays, which were projected into the water as it passed around the quartz tubes, and all disease-producing bacteria were killed instantly. The sterilizer was equipped with a special switchboard, divided into four panels, one for the main control, and one for each of the three lamps.

The switchboard was equipped with switches, reactance coils, resistance controls for each lamp, telltale lamps, and pilot-lamps, as well as the necessary volt metres and ammeters. The sterilizer required 220 volts direct current, and as the current supplied by the local lighting company was alternating current, a 3½ K. W. motor generating set was installed for the purpose of rectifying the current. A four-inch supply pipe was carried around the pool, with two-inch valved branches, with reducers connected to one-inch brass inlet pipes, two of which were located at the shallow end of the pool near the bottom, and four were located at the deep end, two at near the bottom, and two near the top. The pool had an eight-inch drain with bronze strainer and valved so that the water might be held for recirculating, or allowed to waste to the sewer when it was desired to renew the water.

The recirculating pump, which was of the horizontal, direct-connected, centrifugal type, with a capacity of 175 gallons per hour, with a fifty-foot head, was connected on the suction end with this drain, between the pool and the gate-valve. The filters were of the vertical pressure type, with a combined capacity of from 10,000 to 13,000 gallons per hour, with a cast-iron coagulant tank. The filtering material was silica quartz in three grades, placed in layers, the coarsest grade at the bottom and the finest at the top.

The barber-shop, which was to be operated in conjunction with the baths, was finished with tile floors and structural glass wainscoting, the same as described for the baths. It was equipped with vitreous china lavatories, fitted with self-closing faucets, and shampoo fixtures, fitted with thermostatic mixing-valves; vitreous china manicure-tables, with six-inch bowls, supplies and waste being located under the tables and operated by means of knee-action valves; and towel sterilizers which were operated by live steam taken from the high-pressure boiler, which supplied the steam for the baths. The work on the baths was not completed until all of the rest of the building was finished and occupied, as the unavoidable delays in getting specialties and installing them always make this class of work progress very slowly. With the completion of this work our building was completed and our duties as superintendent ended.

AFTERWORD

Now, kind reader, as our tale is finished, we will say a word in parting. Some who have read these pages may have wondered where this building is, some might wish to visit it, so I will tell you: It never was; it is merely a creation of the writer's imagination, designed to illustrate the various materials and methods described in the various chapters, and the experiences and incidents were drawn from many buildings with which he has been associated in his fairly long and rather varied experience. The various conditions described may be applied to any modern building which the reader may have to do with, and if any lesson has been learned from the reading of them, the mission of these pages has been successful and the purpose for which they were written—that is, the helping of the younger generation of the architectural profession to a better and fuller understanding of the problems of modern building construction—has been accomplished.

THE END

The Gleason Works

A Plant Planned for the Future

John W. Vickery, Architect

THE Gleason Works is a notable exception among large industrial plants where provision was made for expansion and where expansion took place along predetermined lines.

The original plant was of the old type, in a congested section of the city, where any material growth was out of question. There was a vision of the future in the management, and a tract of land was purchased, so far beyond the prospective needs that the sale of a portion of it was considered. Fortunately, this was not done, and the original tract has been considerably enlarged by the purchase of adjoining property. The site selected is one of the most desirable in the city of Rochester. It is on the main line of the New York Central Railroad and is between two main thoroughfares, with good street-car service. While not in the outskirts, it is beyond any possible congestion.

The first building was erected in 1905—the foundry. At this time the general scheme of future building was determined and has been closely followed. The foundry is a large structural-steel building with brick and concrete-block walls. Originally the high centre bay had a gable roof with flat skylights. This has since been altered to a monitor of the Pond type, with electrically operated top-hung continuous-steel sash.

A three-story reinforced-concrete building followed in 1907 for pattern-making and pattern storage, but now used for pattern-making, with a separate building for storage.

The original down-town plant was maintained until 1910, when the first unit of the main shop was erected. This consisted of a two-story reinforced-concrete and concrete-block front building, the front designed to harmonize with the front of foundry building, with the main shop one story of steel and concrete. The larger portion has saw-teeth skylights, but there is a higher section for erecting floor, originally with gable roof, but subsequently altered to saw-teeth skylights. The second floor of the front building was used as temporary office. The first unit of the power-plant was built at this time. The erection of these first buildings developed the desirability of a system of planning all columns and piers on centre lines, a standard design and a provision for end walls designed for expansion and additions.

The scheme of centre lines is a most interesting feature. It might be said that the entire plot is divided into rectangles by a series of lines running parallel to front-lot line and 16 feet apart, and another series at right angles to the front-lot lines. These are of various spacings. The original longitudinal lines of foundry which determine those on the east were not designed on any particular multiple. The first units of main shop were designed on multiples of 16′ 0″ and later additions on multiples of 20′ 0″. Practically all piers and columns are on the intersection of these lines. Difficulties encountered where this scheme was not followed have emphasized its desirability, and it is probable that future expansions will be along these lines. This brings openings of parallel buildings opposite each other and makes possible their connection at future times.

While some attempt was made for architectural effect on the front, particularly for the office-building, as is shown in the illustration, a simple standard design has been developed for the sides and rear, as is indicated on detail drawing of typical elevation. While expansion was expected, sufficient provision was not made on first units. Subsequently, all sections where expansion was probable were built with steel columns and girders drilled for future connections, and with sand lime brick walls and piers corresponding closely to the standard concrete pier wall and piers.

After the completion of the first shop unit in 1910, other additions followed rapidly. The office or administration building, erected in 1914, forms one end of the two-story front building, and is, and will be, the dominating feature of the entire front. It is a reinforced-concrete building with precast-concrete walls and cornice. A wide stairway leads from a ground-floor entrance-vestibule to the office proper on the second floor. The offices and drafting-rooms adjoin the second story of the two-story front building and extend into it. The remaining portion of the second story is occupied by the dining-room, seating nearly one thousand people, completely equipped for cafeteria service.

The heat-treatment and case-hardening has a separate building. This has a truss roof with a Pond-type monitor and top-hung continuous steel sash. Lockers and toilet-rooms in this building are installed on a mezzanine floor at one end.

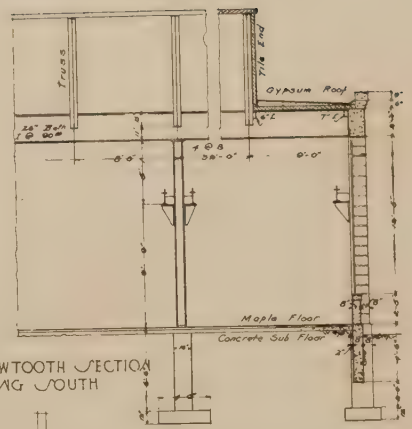
The original unit of the power-plant has had several additions largely along predetermined lines. The boiler-room floor is on a lower level with coal-bunkers extending out below grade, into which coal is dumped directly from cars. All buildings are connected to low level of power-plant by a system of subways.

The most recent addition to the main shop was constructed in 1919, details of which are shown on drawing. It is typical of all the saw-tooth construction, but contains minor improvements over original units. The saw-teeth are constructed of steel trusses 8′ 0″ centres with a poured gypsum roof spanning from truss to truss without purlins. The glass section has a lower 3′ 0″ stationary steel sash and an upper 4′ 0″ top-hung continuous-steel sash, operated in about 80′ 0″ lengths. All sash are glazed with ribbed glass. The trusses span from I-beam girders, which are 16′ 0″ centres, and the girders are carried on H columns, 40′ 0″ centres, making panels 16′ 0″ x 40′ 0″. Brackets on the columns carry travelling-crane girders. Wall sash in the original buildings were wood, but in the more recent additions are solid steel with pivoted ventilators. They are glazed with clear glass in lower lights, and upper lights, where exposed to sun, with a sand-blasted rough glass, and in a few exposed places with ribbed-wire glass. The outer walls are of the standard design previously mentioned, with reinforced-concrete piers and lintel and a simple precast-concrete coping. The piers are relieved by small horizontal grooves about 8″ apart, formed by attaching triangular strips to the form work. Built-up felt roofs without slag are used; no preference has been given to any one type.

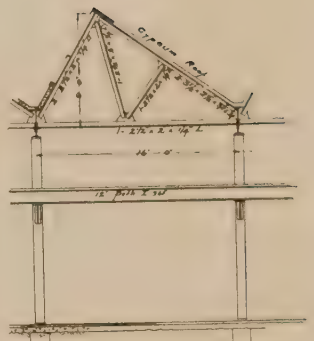
The floors are of planed and matched maple 1⅜″ thick, nailed directly to sleepers with no wood subfloor. The

(*Continued on page 224*)

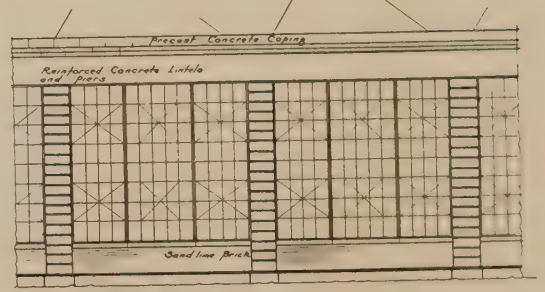
SECOND FLOOR PLAN OF FRONT BLDG



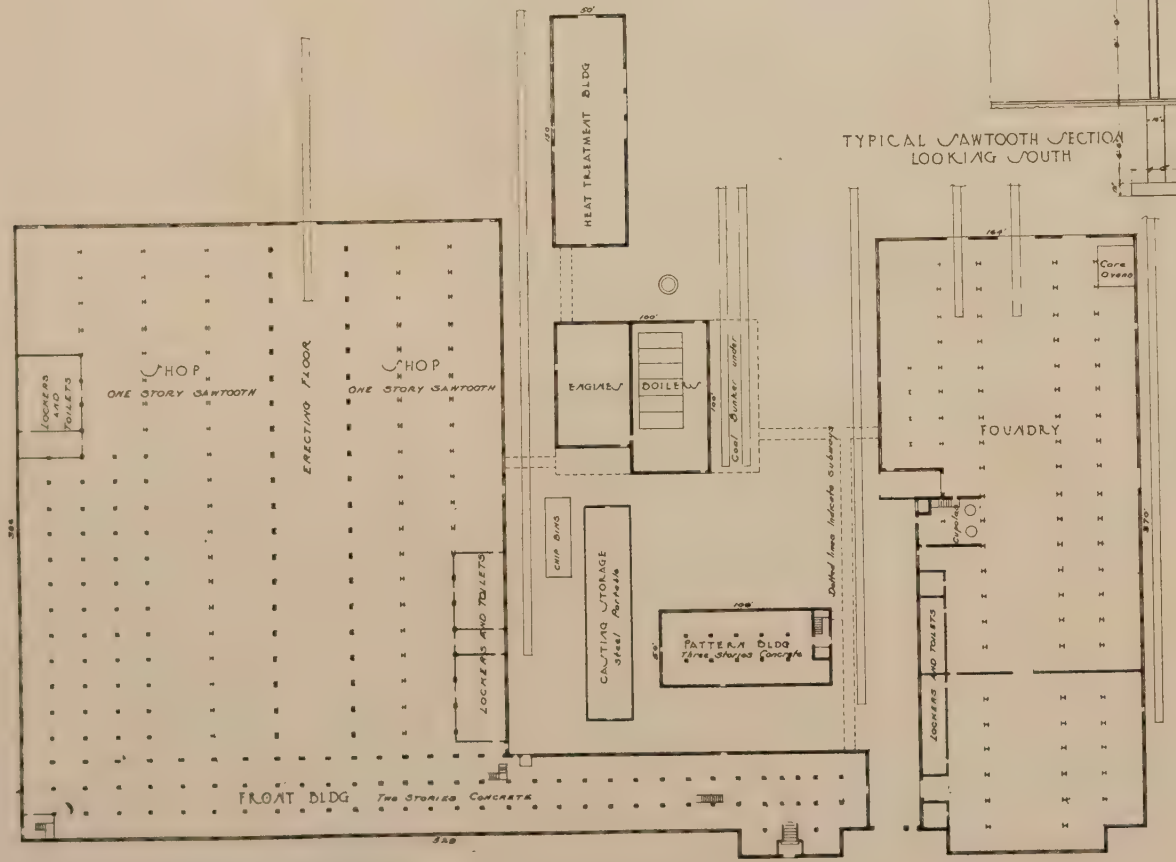
TYPICAL SAWTOOTH SECTION LOOKING SOUTH



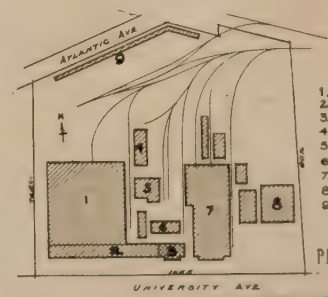
TYPICAL SAWTOOTH SECTION LOOKING EAST



TYPICAL ELEVATION



GROUND FLOOR PLAN OF PRINCIPAL BLDGS



1. SHOP
2. FRONT BLDG
3. OFFICE
4. HEAT TREATMENT
5. POWER PLANT
6. PATTERN BLDG
7. FOUNDRY
8. PATTERN STORAGE
9. GARAGE

PLOT PLAN

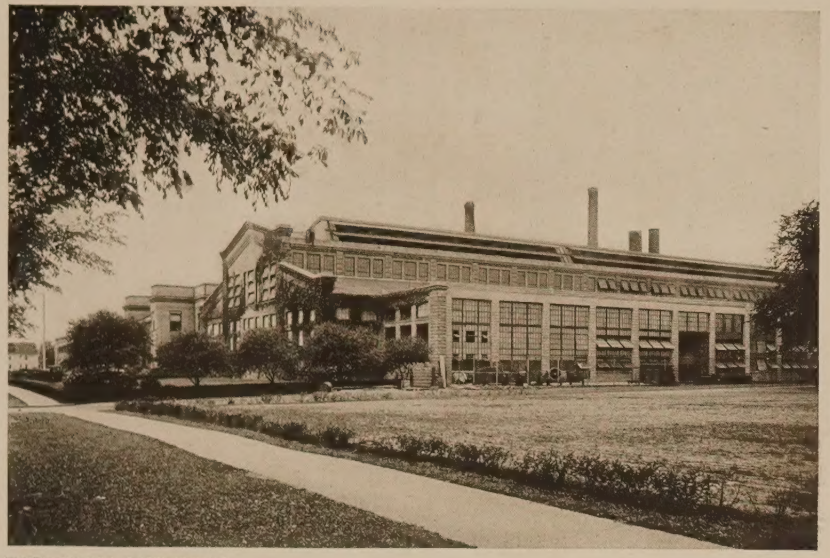
GLEASON WORKS ROCHESTER N.Y.

GORDON and MADDEN *Architects for Office Bldg*

JOHN W. VICKERY *Architect for Principal, Shop Bldgs*

GENERAL VIEW OF FRONT.

OFFICE OR ADMINISTRATION BUILDING.



FOUNDRY BUILDING.

REAR VIEW OF MAIN SHOP.

GLEASON WORKS, ROCHESTER, N. Y.

Gordon & Madden, Architects for Office-Building.
John W. Vickery, Architect for Principal Shop Buildings.

sleepers are rectangular, with galvanized-steel cleats instead of the usual dovetail section. They are laid on a concrete subfloor with a cinder-concrete fill.

The interiors of buildings are painted white, including even the structural steel of trusses.

Minor partitions around locker-rooms, etc., are of sheet steel. Aside from floor, practically no wood is used.

There is a complete system of fire-service pipe with yard hydrants and hose houses, also connections with small hose in buildings. Certain more hazardous sections are protected by automatic sprinklers, but there is no general sprinkler protection.

Direct radiation, vacuum system, steam-heat is used throughout, supplemented by a fan system in the main shop. This is found to be a most satisfactory combination. There is sufficient radiation for heat under ordinary conditions. The fan is used to raise temperature quickly early in the day and later to circulate and introduce fresh air. The cubic content per occupant is so high that ventilation is not a serious problem. The introduction, however, of a certain amount of fresh air, particularly in mild weather, has been found desirable. Although there is no air-washing or cooling device, as the air is drawn from the north side, it has been found possible to materially cool the building in hot weather.

General illumination is used in nearly all places, usually with 150-watt lamps and enamelled sheet-metal reflectors, spaced about 16 feet each way. Very little local lighting has been found necessary, though a few portables are used on erecting floor.

A siding from the main line of the New York Central Railroad extends into the property and a most complete system of yard tracks has been installed, extending into buildings, under travelling-cranes and over coal-bunkers. A steam-storage fireless locomotive makes it possible to transfer and place cars very quickly. There is also a complete system of concrete pavements joining all buildings and storage sections of yard. Elevating electric trucks are used on these pavements for transfer of coke, pig iron, castings, etc.

The property extends along University Avenue over 1,000 feet. There is a steel flagpole 100 feet high in front of office-building, and the 70 feet of lawn between buildings and sidewalk is beautifully planted and excellently maintained, all forming a most attractive feature on that thoroughfare, the result of foresight fifteen years ago.

The Right Way to House the Single Worker

AN example of the right way to house the single worker will be exemplified in the "hotel club" for men which the General Motors Corporation is erecting in Flint, Michigan. It is interesting to note that in the matter of sanitary and other structural standards the corporation is following the lead of the U. S. Housing Corporation which did pioneer work last year in the establishment of standards for the housing of the single worker.

A seven-story fireproof dormitory costing approximately $2,500,000 and having recreational and entertainment facilities to accommodate 2,759 persons is under course of construction. The main building will be 280 feet long and 214 feet deep with a basement and six full stories and a partial seventh story between two elevator towers. All of the upper floors will be devoted to sleeping-rooms, providing accommodations for a total of 1,168 men. Each bedroom will be provided with a lavatory with hot and cold water, and a clothes closet. There will be four general toilet-rooms on each floor, each with shower baths. There will be two light courts above the first story, each measuring 86 by 142 feet to provide light and air to all bedrooms. The building will stand 25 feet from the building line on all street fronts and will be 10 feet from the south line of the property. The building will be of steel frame construction and brick walls with fireproof floors and partitions throughout. The exterior walls will be faced with red brick with limestone trimmings.

On the main floor and in the basement will be located the public recreation-rooms and other amenities for the use both of the single workers and of married men and their families. These will consist in part of a large library with a stock-room having a capacity of 6,000 volumes, a billiard and game room, a gymnasium and smaller exercise room, together with instructor's office, examination-room, dressing-room and bathroom; classrooms with a capacity of 180 scholars; and auditorium with a seating capacity of 1,279 persons; bowling alleys; a cafeteria, a restaurant, a Turkish bath establishment, a drug-store, a tailor shop, a shoe shop and a men's furnishing store; and the largest swimming-pool in the State of Michigan, 25 x 75 feet, with a spectator's gallery accommodating 184 persons.

It is interesting to note the motives which prompted the corporation to launch into such a project. These have been set forth as follows by Vice-President Walter P. Chrysler:

"We realize that such an undertaking is a far cry from the construction of automobiles, which is our business. Nevertheless we feel that the best interests of the corporation are being served when we step out of our beaten paths and spend our money to provide comfort, entertainment and pleasure for our employees and their families. By bringing contentment and happiness to our employees and their families, we naturally surround ourselves with the highest type of workmen and workmanship. Their best interests are our best interests. Their welfare is our aim if we seek to make our welfare their aim."

Announcements

Stork & Knappe, architects, specializing in school work, announce the removal of their offices from Palisade, N. J., to King Street, Ardsley, N. Y., June 1, 1920.

The Portland Cement Association announces that J. W. Johnston becomes District Engineer in charge of the Milwaukee Office of the Portland Cement Association. Mr. Johnston has been with the Association since July, 1916. Before joining our organization he had been City Engineer of Sioux Falls, S. D., County Engineer of Minnehaha County, S. D., and had served in various engineering capacities on railroad and general contracting work. For the past two years Mr. Johnston has been District Engineer in charge of our Parkersburg, W. Va., office.

They also announce that J. H. Riddle, who since 1916 has been connected with the Parkersburg, W. Va., office of the Portland Cement Association, becomes District Engineer in charge of that office, succeeding J. W. Johnston, who has been transferred to the Milwaukee office as District Engineer in charge. Mr. Riddle is well known in West Virginia, having been for a time County Engineer of Roane County, where he was identified with the construction of some of West Virginia's first concrete roads.